Excavating Engineer

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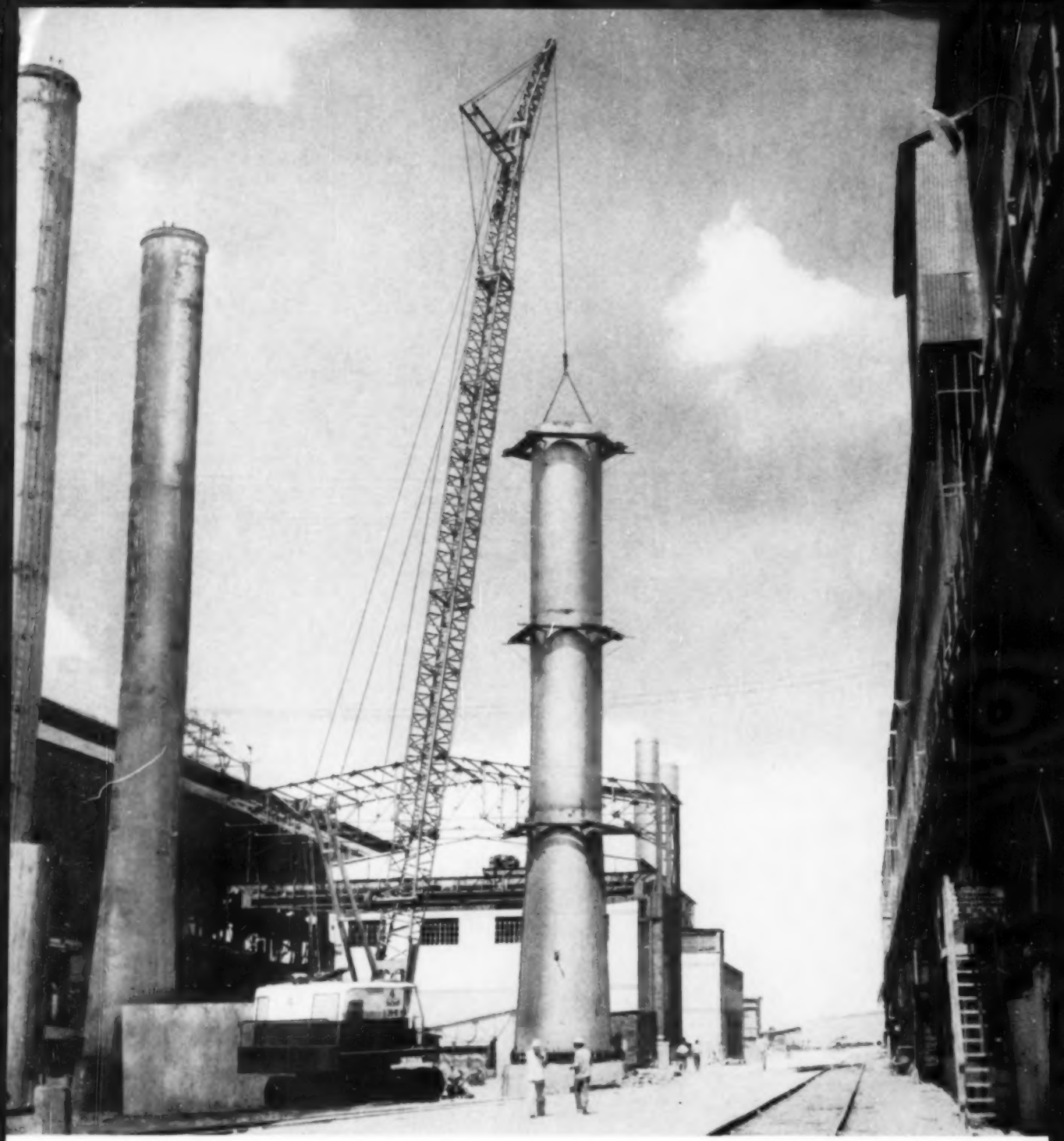
FEBRUARY 1961

Grapple lifts a monstrous rock from a trailer truck. Huge size pieces are used for jetty construction at mouth of the Rogue River on Oregon's coast. See story on page 16.



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Excavating Engineer

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South Milwaukee, Wisconsin

Volume 55 No. 2 **February 1961**

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Single copy price 35 cents

Regular subscription (payable in advance) $3.50 a year

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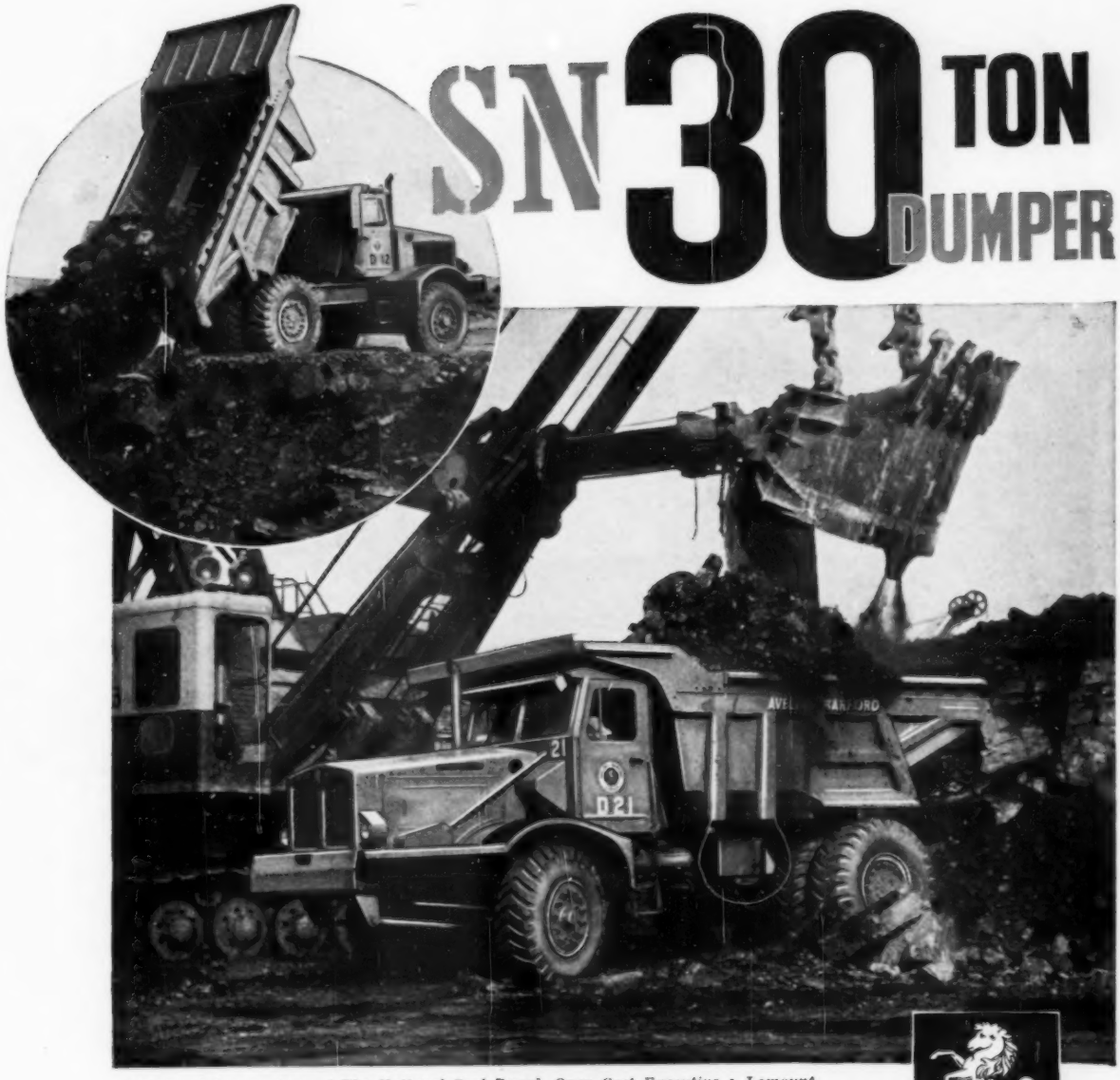

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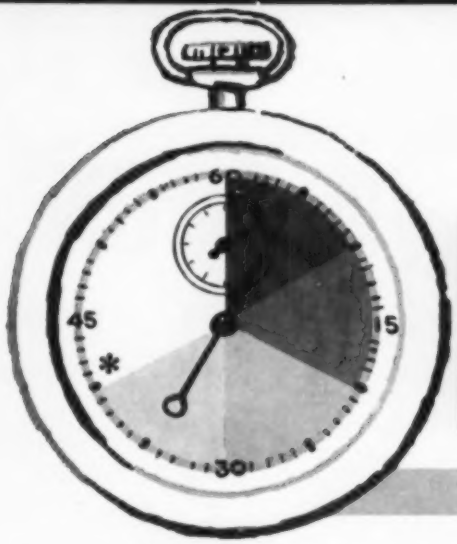

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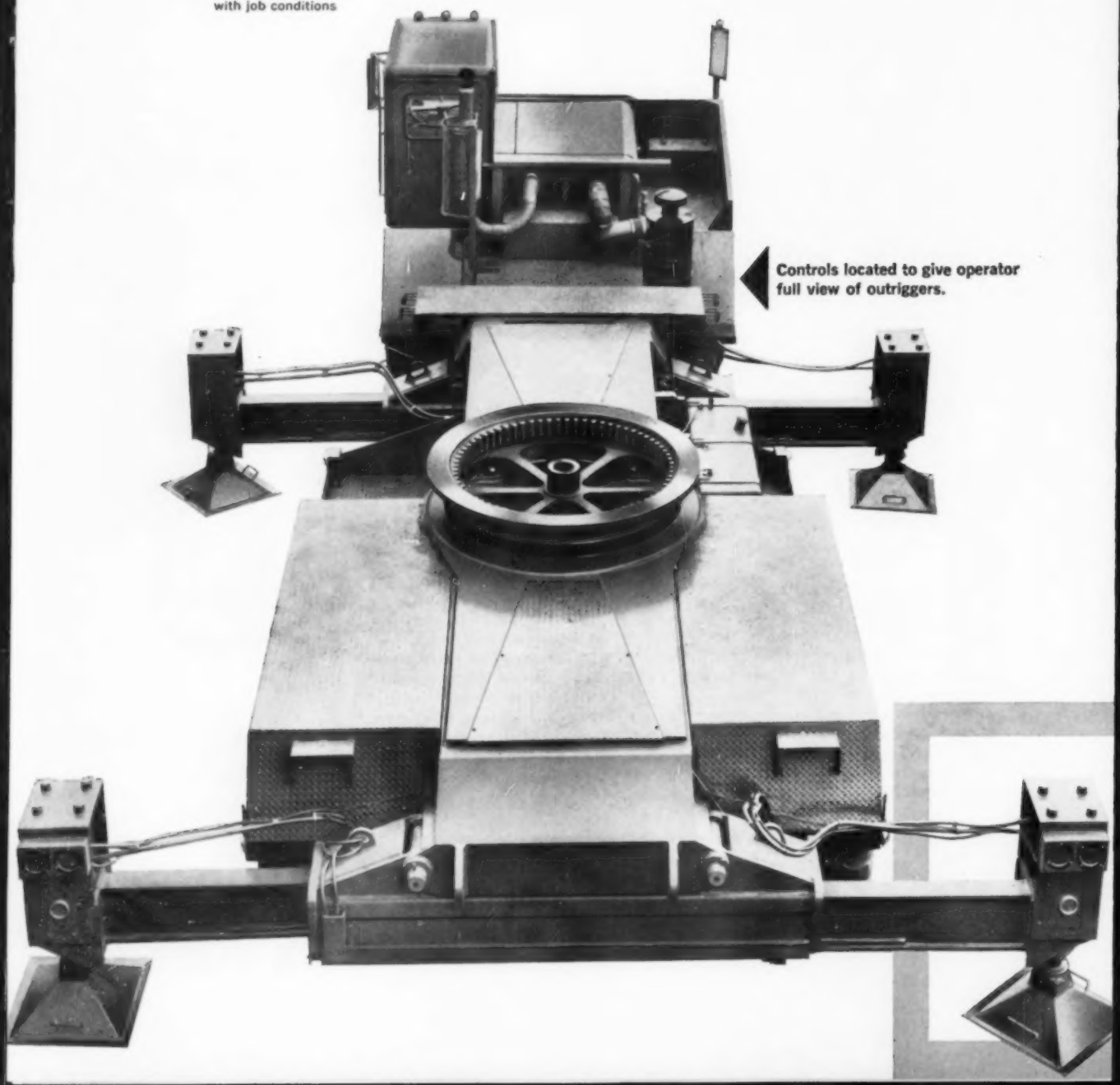

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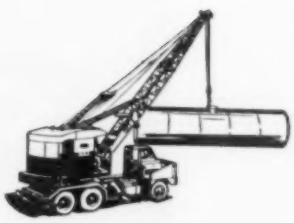

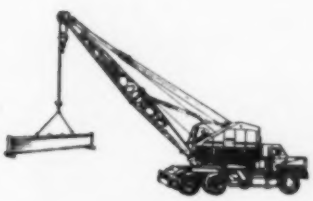

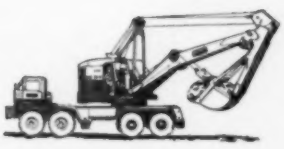

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Scrapers and Clams 'Dig In' for Defense

Construction of three underground Titan missile complexes at Rapid City, S. D. calls for 45-ft. deep open cuts and 160-ft. deep mined silos.

TO keep up with the rapid pace of the broad U.S. defense program, a team of joint-venture contractors called Leavell-Scott and Associates is building operational underground missile complexes near Ellsworth Air Force Base, Rapid City, S. D.

Eight leading contractors make up the construction team. They are: C. H. Leavell & Co., El Paso, Tex.; Morrison-Knudsen Co., Inc., Boise, Idaho; Scott Construction Co., Oakland, Calif.; Paul Hardeman, Inc., Stanton, Calif.; Johnson, Drake & Piper, Inc., Minneapolis, Minn.; MacDonald Construction Co., St. Louis, Mo.; Olson Construction Co., Denver, Colo.; and F. E. Young Construction Co., San Diego, Calif.

Rather than tunneling in, the LSA contractors are handling the job by "cut and cover" methods. Open cut excavation for the three complexes totals about two million yards. The initial excavation was subcontracted to Taggert Construction Co., Cheyenne, Wyo., with a fleet of seven Cat DW20 and DW21 scrapers, six D8 and D9 push-dozers and one Cat No. 12 motor patrol. The soil was removed to an average depth of 45 feet. The material is stockpiled and will be used later for the huge backfill job. When the job is completed, the area backfilled and replanted, only the concrete pads and roads will give a clue to the enormous facilities beneath the surface.

Because a 30-day gap exists between construction stages at each site, Taggert was able to handle the initial excavation at each site with a single equipment spread. The LSA team, however, is working on all complexes simultaneously and employs a huge equipment spread. For instance, to handle the vast amount of silo excavation, form setting, concrete work and various other lifting chores, a total of 19 cranes were on the job at the time of *Excavating Engineer's* visit.

Each complex has three launchers, each consisting of a missile silo, an equipment terminal and a propellant terminal. The 50-acre complex also contains two massive igloo shaped structures to house a control center and power house and two small silos for retractable radar antennae. In total, the three complexes call for the mining of 27 silo shafts. The entire system is connected by a series of underground tunnels which permit

(Left) **The 45-ft. deep open cut excavation is achieved with a fleet of scrapers and dozers. For the three complexes, open cut excavation totals about two million yards.**

The deep open cut excavation of this Titan complex forms a giant cloverleaf pattern on the open grazing land. In the left foreground are the three missile silos, each with propellant and equipment terminals. The large domes are the powerhouse and control center and the twin silos at top right are the radar antennae installation.

movement of personnel and materials between all components.

Missile silos, although less impressive than the massive igloo structures, constitute the major work involved on a complex. Each will contain not only the 90-ft. long, 10-ft. wide Titan, but its launcher and its crib for a weight exceeding one million pounds. To carry this weight, the silo base is composed of six feet of concrete reinforced with 90 tons of steel.

From the bottom of the 45-ft. open cut, the missile silos are sunk to a depth of 120 feet. Harlan F. Pierce is in charge of the mining operation on all three complexes. The mining is handled by a "rip and haul" method with teams of tractors and clamshell mounted cranes.

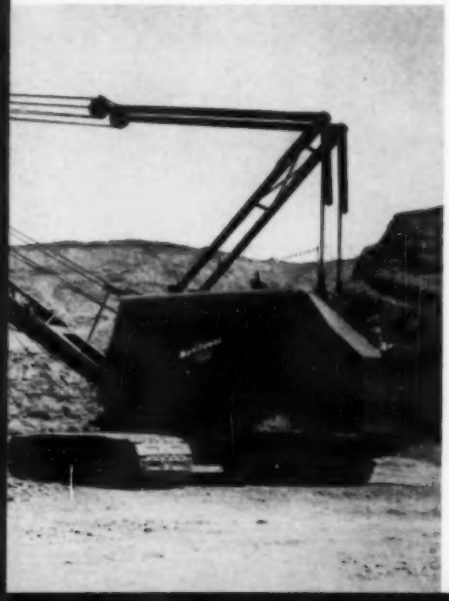
Tractor-Clamshell Team

A tractor equipped with rear-mounted rippers and front-bucket loosens material in the 45-ft. diameter shaft and moves it to one side for pickup by the clamshell. Walls are trimmed to exact contour by workmen with air spades. Periodically, lining crews move in to set 6-in. steel ring beam supports and to string welded wire fabric over the exposed walls. Then the walls are sprayed with gunite. This mixture of cement, sand and water (applied by pneumatic pressure through a cement gun) protects against weathering and sloughing in the silos.

Silo construction caused men to work under conditions of dangerous exposure, but various safety precautions were successful in preventing any serious accidents. In fact, only three injuries occurred during the mining phase, all of a superficial nature.

To minimize obvious hazards, all cranes on the job were equipped with down power or "dead man controls" for safe positive control. This was especially important on the silo bailing work where men were working on the bottom of the shaft. The crane operator above could not see to the bottom of the shaft so a guide man was stationed on the bottom to direct the operator. The operator picked up

***(Below)* Mining of the 160-ft. deep missile silos is handled by 60-ton crane equipped with clamshell. Walls are lined with gunite to prevent cave-in.**



***(Below)* Deep in a missile silo, a tractor equipped with rear-mounted ripper and front-loader pushes material under barrier to be picked up by clamshell.**

The crane spread on this job is big and varied—mostly long-reach transit cranes. At left, swinging a steel beam, is a 30-ton Koehring. The 22-B crawler, above, handles batch plant material and the 45-ton rig, at right, bails out a silo.

a load or lowered the clamshell only on telephoned orders from below.

Silo work areas were divided to further protect workers from clamshell spillage. This barrier consisting of heavy vertical planks attached to steel beams was fastened to the support rings. Extending almost to the silo floor, this "bang board" insured protection for the men working in the shaft. The tractor working in the shaft pushes loosened material under the bang board and the clamshell bucket picks it up and swings it to the surface without threatening the men below.

The nature of this job, deep silo mining and placing of steel concrete and forms from great distances, calls for the big crane spread. What is needed most is cranes offering mobility and long reach. Four 45-ton Bucyrus-Erie Transit cranes with 80-ft. booms and 30-ft. jibs work on the silo claming operations, assist in the heavy tunnel section and form sets and also are used in slip-forming concrete. Crawler cranes are impractical for most of the crane work for much of the material must be picked up and moved between the various structures of the complex.

Mobility isn't a necessary feature for cranes handling the deep missile silo mining. What the contractors want there are long-reach crawler cranes providing a good foundation and exact control. Three 60-ton Manitowoc 3900 crawler cranes are used to clam out the silos. For the long reach necessary they are equipped with 100-ft. booms and 30-ft. jibs.

The remainder of the crane spread includes: two 45-ton Koehring 445 mobile cranes to assist in setting tunnel sections and large tanks; four 30-ton Koehring 330 mobile cranes for some of the lighter steel and form lifts; one Bucyrus-Erie 22-B Transit crane for form work; one Bucyrus-Erie 22-B crawler crane equipped with clamshell to handle batch plant materials; one Wayne model-20 and three Austin-Western hydraulic cranes for use in the forming yard and on steel unloading.

Equipment Spread Varies

The earthmoving equipment run by LSA was used for silo mining, trench work and general road work and clean up jobs. Seven Caterpillar model 955 and two model 977 Traxcavators equipped with rippers and front-end loaders were used on the silo mining operations along with two Eimco model 106 loaders. Two ¾-yd. Insley hoes were used on closer trench work for tunnels, and four Cat No. 12 motor graders handled general blade work and road grading.

After the initial open cut excavation by Taggert's big scraper spread, some additional tunneling and hauling was handled by three LeTourneau-Westinghouse model D 10-yd. scrapers, one Allis-Chalmers HD-11 and one HD-15. Many International dozers from TD-7's on up to TD-18's were on the job, with the list varying greatly from day to day.

Rounding out the accessory equipment list used by LSA were three Joy RP-900 air compressors for jack hammer power; about 60 pumps in the Flygt, Worthington and Layton lines; 48 electric Lincoln and Miller welders; and about 50 portable heaters for winter operation.

Space-age construction with all its problems requires new techniques. The LSA engineers are meeting the challenge with innovations that may

Keeping haul roads open and making additional tunnel cuts, this 10-yd. scraper moves to dump site with another load.

Tons of steel and concrete are placed in the complex structures. The long reach provided by Link-Belt and P&H mobile cranes above spot the lifts right where they are needed. Wide-spread distances between structures call for fast mobile cranes.

set new standards for missile base construction.

Confronted with the problem of pouring 2-ft. walls around a 125-ft. perimeter with a maximum tolerance of ¼ inch, it was decided to try slip-forms. With a little practice, the process was turned into an exact science. By working around the clock, the slip-form day accounts for as much footage as conventional methods achieved in four days. Hydraulic jacks lift the forms at a rate of one inch each eight minutes.

The impressive dome-shaped powerhouse and control center are the muscle, heart and brain of the installation. The 100-ft. diameter control center and 120-ft. diameter powerhouse walls are from 42 to 18 inches thick. To withstand the shock of missile firing and possible nuclear attack, the giant igloos rest on "innerspring mattresses" of coil springs and spring beams. Designers say they will withstand shocks equal to many times the force of gravity. In fact, only a direct hit would be capable of destroying the underground complex.

The delicate mechanisms of the missiles must be guarded against shock. To do so, the Titan is placed on a separate steel structure called a "crib" which is mounted on shock-isolation cylinders. The top of the silo is covered by thick concrete double-pivot doors, actuated by hydraulic cylinders. At launching, as much of the countdown sequence as is possible is handled with the missile still inside the hardened environment.

On previous Titan facilities a wire winding method was employed to post-tension the base of the huge control center dome. LSA engineers are successfully using another method. Conduit-enclosed 1½-in. straight line cables are "formed in" the 15 pilasters located at regular intervals around the footing. Seven vertically spaced cables encircle the base 12 inches inside the footing, extending counter-clockwise to the fifth pilaster where they are anchored. The process is repeated until all pilasters are interlaced. The concrete footing is then poured.

When the dome is completed and the concrete cured, two hydraulic rams stress the cables from each end simultaneously until the stressing is complete. A retaining ring holds the jack-plates under desired stress and the cable conduits are filled with grout under high pressure.

Although statistics never tell the whole story, the magnitude of this project can be better understood by looking at some of the contract quantities. Over two million cubic yards of dirt will be excavated and replaced on the open cut. Shafting accounts for an additional 110,500 yards of dirt. Concrete poured will add up to 104,000 yards and 35,000 tons of steel will be placed. The nine missile silos alone total 69,678 yards of dirt excavation and 260,000 square feet of gunite. Cement used, over and above gunite application, is 133,000 barrels.

Time Urgent

The five major items, missile silos, equipment terminals, propellant terminals, control centers and power houses, account for over $19 million of the total $28.5 million contract awarded to LSA. Each missile silo will cost approximately $655,000 and a single powerhouse, before it is equipped, will cost $1.8 million. There is much more than money involved in the sense of urgency on this job. As one of the engineers put it, "Lost time on this job could mean a lost nation." The LSA team has con-

tinued ahead of schedule throughout but the contractors are well aware of the fact that on missile facility work anything can happen to throw them off.

Time isn't the only headache factor, however. The Titan, big and powerful, is a delicate instrument that must have everything in its favor to function properly. Every phase of the construction, therefore, is completed under the tightest tolerances possible. A good example of the extremely high standards set for the missile program can be seen in what normally would be thought of as a relatively simple item—gas storage tanks.

From four to eight of these containers will be placed in a group and interconnected to the Titan by stainless steel pipe. These tanks will contain the high pressure helium and nitrogen which force liquid fuel and oxygen into the missile and also purge the fuel systems after firing. The National Tube Division of U. S. Steel Corp. is performing exacting inspections to meet the specifications which require interiors and component parts to be free from all hydrocarbons and foreign particles larger in size than 150 microns (.0059-inch).

The squadron being built at Ellsworth Air Force Base is the fourth of six that make up the nation's first weapon system concept. The contracts for the first two squadrons located near Lowry AFB, Colo., were awarded in the spring of 1959. In November 1959, the construction contract for the Larson AFB, Wash., was let, followed by the Leavell-Scott award at Ellsworth AFB, S. D., in December. The last two contracts for the Beale AFB squadron in California and Mountain Home AFB squadron in Idaho were awarded in January and February 1960.

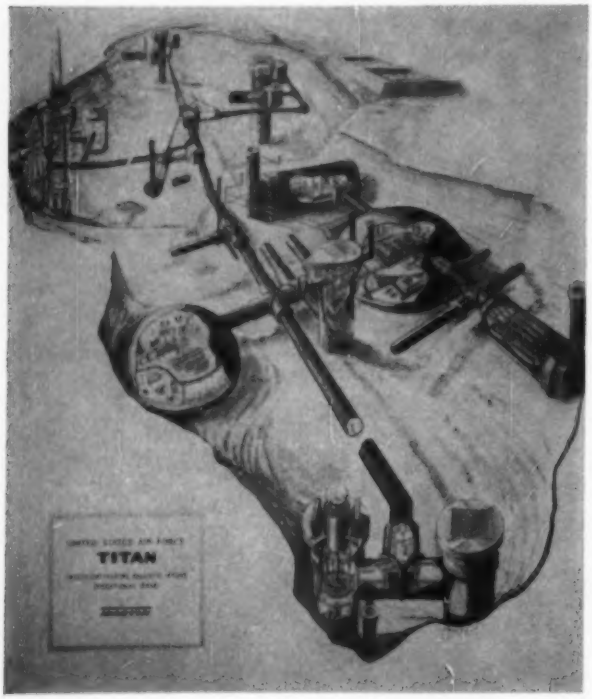
Technical Functions

Each squadron consists of three separate missile launching complexes dispersed around an existing support base. The support base provides administrative support plus a number of technical support facilities such as a missile assembly building for maintenance, a liquid oxygen plant to generate liquified gases and fuel storage facilities.

Before the closing Dec. 15 deadline, such items as generators, air filtration and sanitation systems, personnel tunnels, missile fueling systems and miles of intricate electrical circuits must be constructed. When the LSA phase of construction is completed, technical contractors will move in to complete the furnishing of the facility. Following final checkout and acceptance, the complexes will pass to eventual control by the Strategic Air Command.

Project Manager J. D. Abrams heads the LSA team. N. G. Farwell is the mechanical project manager and J. D. White is the coordinating superintendent. Each of the three sites is headed by a site superintendent and a site engineer. On complex 1A, Woody Brady is the superintendent and Bill Foxwell is engineer. On 1B, C. O. Smith is superintendent and Bill Bruguier is engineer and on 1C the job is handled by Superintendent Harroll Tannery and Engineer Don Brockett.

Working with Lt. Col. Edward W.

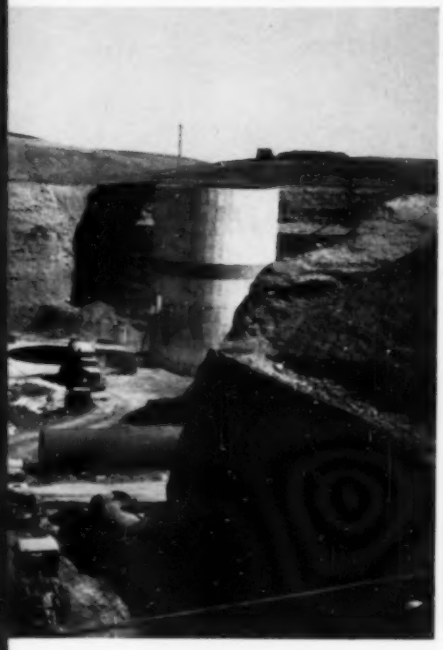


(Left) **Artist's drawing shows completed operational complex. Under enemy attack, complex would be a complete self-sufficient city with its own fresh water and filtered air supply.**

(Right) **Keeping the LSA team on schedule despite tough deadlines and rigid specifications is a difficult job. J. D. Abrams, project manager, *(left)* looks over some of the paper work with Darrell J. Bandy, former project manager.**

Smith, area engineer for the Corps of Engineers, Ballistic Missile Construction Office, Los Angeles, are Otto Steffens, Milton Parker and Richard Rusnack as resident engineers on the three sites. Col. Carlin Whitesell, who was contracting officer on the massive Ballistic Missile Early Warning System construction at Thule, Greenland, directs this project as con-

(Right) **Transit crane with 80-ft. boom and 30-ft. jib swings concrete bucket up to workmen on top of silo.** ***(Below)*** **Rising from the floor of open cut, huge igloo structures that will house powerhouse and control center take shape.**



tracting officer for the missile agency.

It is strangely ironic that this entire effort of men and machines is for facilities that no one really wants to use. The Titan is a retaliatory weapon of devastating power, capable of delivering a nuclear warhead over 6,000 miles at speeds greater than 15,000 mph. The men building this "hard-base" fully realize that it is a grim business necessary to American security and freedom.

(Below) **Tough rock is trimmed with air hammers. Most of the rock excavation is handled with ripper-mounted tractors.**

An indication of the steep slopes is seen in this photo of a Cleveland model 320 ditcher. In some cases, the machine had to be anchord by a tractor.

'Flat' Illinois Terrain Makes Rough Going for Pipeline Job

On an 18-mile loop around Peoria, Somerville-Illinois Co. contends with ridges and ravines, fire, ditch-losing downpours, sanitary landfills, swampland and 23 crossings.

ILLINOIS, generally considered to be flat as a pool table, would appear to be a snap for pipelaying crews, even when the job calls for 24-in. diameter 5LX42 pipe.

But that's not necessarily so. Pat Mask, president of Somerville-Illinois Co., of Peoria, and his handpicked crew will testify to that.

Somerville-Illinois looped Peoria last fall with 18 miles of natural gas pipe for the Central Illinois Light Co. The lateral was run from the Panhandle-Eastern Pipeline at nearby Creve Coeur across the Illinois River. The river crossing was handled by Pentzien, Inc., of Omaha, Neb., a subcontractor for Somerville-Illinois.

In that short distance the pipeline crew encountered rollercoaster hills, V-bottom valleys, fire ditch buckling downpours, four refuse landfills, a swamp, seven creek crossings and 12 road and four railroad crossings that required borings.

The Peoria southwest loop was one phase—and the toughest—of a 53-mile pipeline project. The second and final phase calls for laying 35 miles of 30-in. natural gas line from Peoria north to Henry, Ill. The line was coated and wrapped over the ditch. This phase of the project was expected to be comparatively routine, but it did have an unusual sidelight.

(Above) A Cat 572, an MD8 and an MD7 pipelayer were used to lay the 24-in. pipe on this roller-coaster hill. *(Right)* Welders complete tie-in at end of a 600-ft. sanitary landfill.

The pipe will be used both as a feeder and a storage line.

A 16-in. line would be ample to meet present and near-future requirements, A. L. Drake, CILCO's general superintendent of gas operations, said. The company reasoned, however, that since it had to pay anyhow for rights-of-way and pipe installation, it might as well put in larger pipe and use the excess capacity for storage. This is estimated at 30 million cubic feet under 500-lb. pressure. As a result on peak wintry days, a portion of the gas can be fed back into the Peoria system and thus CILCO can maintain a steady flow for its customers.

Numerous Bends

Meanwhile, Somerville-Illinois Co., a subsidiary of Somerville Construction Co., of Ada, Mich., made steady progress on the Peoria loop. Indicative of the rugged terrain encountered is the fact that the bending crew averaged 60 bends to the mile but hit as many as 86 in one mile. Field bends with the CRC bending machine were held to a maximum of 1½° per inch of pipe diameter; factory bends up to 90° also were used. Minimum distance from a bend to any weld joint was five feet.

Numerous 60 to 80% slopes were scaled and the bottoms of ravines were so sharp that many had to be bridged with 12-ft. planks. Despite the extreme angles of repose assumed by the Caterpillar pipelayers, their sure-footedness enabled them to handle the 60-ft. joints with little difficulty, Pat Mask said. The crew averaged about 3,000 feet per 10-hour day, with a best day's record of 4,800 feet.

Spread Supt. Frank Morris used a Caterpillar 572, a MD8 and a MD7 pipelayer on tie-ins, a MD7 to handle pipe for the CRC bender, a MD7 to set in pipe for the pipe gang, two D7's each with side-mounted Lincoln 250-amp welding units, a D6 to tow three skid-mounted Lincoln 200-amp units for the welding crew, a D6 to winch power shovels up steep inclines, and three D8's (two with power shift transmission) and a D7 on pioneering and grading. Road crossings were made by a ¾-yd. Bucyrus-Erie 22-B, powered by a Cat D318 diesel engine, which dug approach ways, and a 572 pipelayer to cradle the CRC boring machine which handled the boring operation.

Ditch work was handled by a Cleveland 320 ditcher, a ⅝-yd. Insley K and three ¾-yd. Bucyrus-Erie 22-B's. Backfilling the ditch were a Cleveland 190 backfiller and a D7 with angle dozer. Two Ford stringing trucks were loaded at the yard by an Insley L and unloaded and strung on the line by a MD7.

The pipe, made by Republic Steel, was doped and wrapped by Hill-Hubbell Co. at Hammond, Ind. Grit-blasted and primed, it was given a $\frac{3}{32}$-in. double coat of enamel, a layer of tar asbestos felt, a $\frac{1}{32}$-in. coat of enamel and wrapped in heavy Kraft

paper. A wall thickness of .375 was used on the ditch and .50 for crossings with 30-in. casings. The pipe will be cathodically protected against corrosion by Goodall rectifiers.

The pipeline project was a challenging one in other respects. Eight severe sideslopes had to be benched to a depth of up to 20 feet. When buried utility lines were crossed by the ditch, the pipe had to be carefully threaded under them and tie-ins made in bellholes. The 16 road and railroad crossings also required welding in the ditch. Superintendent Morris used two welders on the stringer bead, two on hot pass, three on filling and capping and two on tie-in.

Pipe padding was limited to spotty rocky zones and to residential areas where the ditch was located within the street limits. In the latter case the excavated clay was replaced by select granulated material, usually sand or bank run gravel. Backfilling with clay would have created voids. In rock, the pipe was protected by a 4-in. layer of sand at the bottom and four to six inches on top.

In one case, however, sand was used as an insulator against fire. On the southwestern outskirts of Peoria the right-of-way crossed a 200-ft. open garbage dump, one of four refuse deposits encountered. It had been smoldering for years. When it was opened up by the 15-ft. ditch, it burst into flames. This came as no surprise to CILCO or to Somerville-Illinois. Protecting the pipe at that point with a sand firewall had already been written into the contract and had been approved by a state deputy fire marshal. The blaze, however, had to be put down by firemen before the pipeline crew could insulate the pipe with a 2 to 3-ft. shroud of sand.

Spread superintendent for Somerville-Illinois Co. is Frank Morris. The pipeline outfit is a subsidiary of an Ada (Mich.) construction firm.

A few days later it rained—sudden heavy downpours on two successive days. Runoff was so severe that two children, splashing in roadside ditches (not the pipeline ditch) were swept into culverts and drowned. Sections of the ditch, particularly the seven crossings along Kickapoo Creek, collapsed and had to be re-dug.

Before the 145-man crew reached the Illinois River, further challenges loomed ahead—7,000 feet of swamp and another 1,000 feet of shallow lake. A total of 896 concrete 5,400-lb. weights were used, hinge-type on the creek crossings and saddle-type for the swamp and lake. Cover ranged from four to eight feet. When completed the southwest loop was tied at 12 points into CILCO's existing 16-in. pipeline serving the Peoria area.

Assisting Superintendent Morris were Charles Copeland, assistant spread superintendent; Charles Clifford, ditch foreman; Stephen Cantrell, right-of-way and stringing; Henry Grotz, clearing; James Harper, bending; T. K. Matlock, pipe; Roland Zumwalt, welding; Bruce Blankenbaker, lower-in and tie-in; Everett Martin, backfill and cleanup. Vernon Boynton was project engineer and coordinator, and Neal VandeSchraaf, general manager for Somerville-Illinois.

Meanwhile, Pentzien spanned the 750-ft. river and about 300 feet on

Hoe plunges its ¾-yd. dipper into Kickapoo Creek as it cuts a trench for the pipe. The meandering creek had to be crossed seven times.

each side of it with concrete-coated pipe weighing 530 pounds per lineal foot.

Using a 12-in. portable dredge mounted on a barge, the firm dug a trench 10 to 15 feet deep under direction of Forrest H. Andrews, field superintendent. The ditch was cut 75 feet wide at the top and sloped to a 35-ft. center line at the bottom, the extra width and depth compensating for shifting sand.

The pipeline right-of-way crossed the river just below the Peoria lock and dam which is situated on the east bank. Because the Corps of Engineers plans to widen the channel at that point to ease handling of river traffic, it was necessary to dredge out an area 200 x 300 by 25 feet deep with the aid of the dredge and two American draglines of 2½ and 1-yd. capacities. Working around the clock the crew dredged 3,000 yards a day. A D7 was used to level the excavated material and maintain a smooth work surface for the draglines.

Using a fairlead block and a skid-mounted 100-ton winch, crews pulled the pipe across the river as the 60-ft. joints were welded and cement-coated. Under normal conditions all the pipe would be welded prior to the pull. However, in this case the tie-ins had to be made on a narrow spit of land hemmed by the river on one side and the swamp on the other. Superintendent Andrews assigned a Cat MD7 tractor and an Allis-Chalmers HD-15 to handle the 14½-ton pipe joints, carrying them from a nearby stockpile and cradling them for line-up and weld.

Walking on tires to protect the pavement, a Cat D7 tractor with a pair of side-mounted Lincoln 250-amp welding units supplies power to men on the firing line in the ditch below.

To increase the buoyancy of the pipe as it was pulled through the water, 12-ft. steel floats three feet in diameter at their widest point were strapped to the pipe at calculated intervals. At the same time a float released cable was installed under the .035-in. straps. The floats reduced the weight of the pipe from about 135 pounds per foot in water to a mere five pounds. The dredge barge was used to cradle the leading end of the pipe while welds were completed. When the entire length of pipe was positioned above the ditch, a jerk of the float release cable snapped the strapping and the cylinders floated free. The crossing was pulled in three days.

(Center) **Illinois River crossing was subcontracted to Pentzien, Inc., Omaha, Neb. To increase buoyancy, floats reduce pipe weight from about 135 pounds per foot in water to five pounds.** ***(Right)*** **Pentzien's Field Superintendent Forrest H. Andrews indicates thickness of pipe coated with 4⅝-in. layer of concrete.**

Jetties Tame the Rogue

Contractors team up to bid and build heavy rock structures where Oregon's Rogue River empties into Pacific Ocean.

by Ray Day

TWO contractors who dared to take a chance on a rock supply have won their gamble, shaving three months off the completion time of two jetties at the mouth of Oregon's Rogue River. J. N. Conley and G. D. Dennis & Sons, both of Portland, teamed up in a joint venture to low-bid the Corps of Engineers harbor-development contract.

Started last summer, the job was completed about three months ahead of the time allowed by the Portland District office of the Corps.

The two jetties will tame a troublesome situation which has existed from time immemorial at the Rogue's mouth. At this point there has been scouring, shifting sandbars, and an indeterminate beach. In addition, the two heavy rubble mounds will do a great deal toward the protection of nearby Gold Beach, and the Gold Beach airport which lies close to the beach line.

It's been an equipment show from start to finish, featuring the production and handling of very heavy rock. In fact, 20, 25 and 30-tonners were the rule rather than the exception, and one particularly big one weighing 39½ tons was handled without a mishap. The contractors found ways of handling such big stone so efficiently that they quarried, hauled and placed 5,292 tons in one 10-hour day; they hit a high-production mark of 19,000 tons in one 5-day work week. By comparison, 2,000-ton days are frequently satisfactory to many a marine contractor.

The jetties were designed to take the worst punishment that the north Pacific can offer, as huge waves in winter batter relentlessly against the 400-mile-long Oregon coastline. In cross section, both jetties have a 26-ft. wide crest set at Elevation plus 18.0 (above mean low water). From that point, both jetties slope downward at a 1½ on 1 ratio, until they meet the ground line. This varies considerably, depending on the depth of water.

In some cases the ground line is at Elevation 0. At the deepest point, where scouring waters from the Rogue lapped around one point of a jetty and undercut the sand, construction had to be carried down to minus 40. It can readily be imagined how much rock was in that section.

Design of both jetties is along standard procedure, starting with smaller-size rock in the center, and

Cross sectional photo of jetty shows how huge pieces of cap rock are placed on the outside to counteract wave action; smaller sizes make up the center portion. Boats at right show salmon fishing at its height.

Detachable truck bodies in early-stage work permitted whole loads of rock to be lifted from trucks and dumped into the structure by crane.

With loaded truck body at the end of its 70-ft. boom, Manitowoc 4000 crane swings around to the dump site. The crane also used a set of McCaffrey tongs for placing bigger pieces.

working outward toward a heavy armor coat of massive interlocking rock of ponderous size. Beginning in the center is a mixture of C and B rock—classified by specifications and governed as follows:

C rock ranges in size from 100 pounds to a ton. Not more than 20% of the final volume can be composed of this material.

Mixed with it is B rock, weighing from 1 to 6 tons, with a 3-ton average. This size rock makes up a variable percentage, and from all indications will represent about 35% of the total volume. The heavy outside armor coat is A rock. A rock is all over 6 tons, with a 10-ton average. Placed at least 5 feet thick as an armor coat on the outside of the jetties, it represents at least 45% of the total structure volume.

Armor Rock

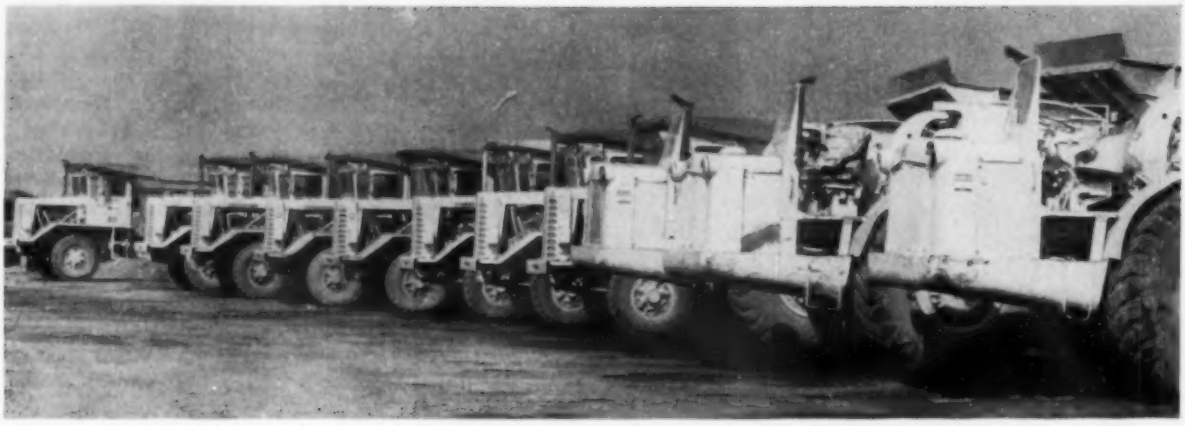
Special requirements include the complete construction of the outer 50 feet of the north jetty, with A-type rock averaging 27.7 tons each. The contractor solved that special requirement by stockpiling the big rock along the beach line, and then using it at the proper time.

All told, there are 744,000 tons of rock in the two jetties. Contract price was $2,890,000.

One of the big unknowns, so far as the contractors were concerned, was the selection of a good quarry site. In marine construction, one of the hardest things to find is a supply of rock which meets the following requirements:

1. There must be enough of it to do the job.
2. It must lie in such a way that it can be quarried economically.
3. It should meet special specification requirements for soundness, hardness, specific gravity or weight, deterioration and so on.
4. Its formation must be such that it can be broken out in large pieces. This was one of the most important requirements, by the way.

Of several bidders, few contractors believed—as Conley and Dennis did—that an adequate rock supply could be quarried within 2½ miles of the jetty site. Some good rock existed up the Rogue River, but long hauls would be necessary to get it out. Hunter Creek also has good rock about 6 miles from Gold Beach, but that haul was too long, and production problems would have been nu-



Lineup of hauling units for week-end maintenance service shows Euclids and International Payhaulers used for moving rock.

merous. What's more, in all cases these hauls would have to be made over established highway systems, so that legal weight requirements would have to be met.

After looking over the situation carefully, Conley and Dennis decided that an extruded, pointed "greenstone" rock outcrop just east of Gold Beach would meet specs, and would provide enough rock to build the south jetty, at least. Samples of the rock were taken, and they met some rather tough specification requirements. For example, specs called for rock with a minimum solid-form weight of 165 pounds per cubic foot. But if the weight went over 170 pcf, the tonnage in excess of 170 pcf would be deducted from actual scale weights.

What that meant, in effect, was this: if the contractors tried to quarry rock weighing 180 pcf, they'd lose 10 pounds of each cubic foot quarried, handled, hauled and placed.

The gamble paid off well, though. Average rock weight ran just about 170 pcf, thus giving the government the heaviest possible rock to stand the battering of heavy ocean waves, and saving the contractor's having to stand excess handling losses.

Percentages of each type of rock checked out almost on the nose, too, thanks to close cooperation between Dallas Dennis, the contractor's project manager, and E. B. Oliphant, Corps of Engineers chief inspector at the site. The biggest payoff of all was the fact that the quarry furnished enough rock to build both jetties! New, expensive sites were unnecessary. There was some difficulty at the tail end of the job, because a face had been opened up so deep that overburden began to ravel and cave. That problem was solved by using a Cat D9 for an anchor, putting a D8 with a Hyster winch in the line to handle a Bagley bucket for scaling the excess material down, and running part of the fair lead line through a Skookum block hanging from the stationary dipper of a Bucyrus-Erie 88-B loading shovel.

Size of caprock is dramatized here as the 88-B operator cooperates gingerly with Payhauler driver to load a big one. The shovel regularly handled 32, 33 and 34-ton stones directly off its dipper teeth.

Greenish Cast

In developing the quarry, the contractors chose to work the rock face chiefly from the bottom, in 45-ft. lifts, using drilled holes and lifter shots to break up the material. The rock was a geological mixture containing pyrites, some basalt, rhyolite, and some olivene. The latter gave the rock a greenish cast. Despite its heavy weight, the rock wasn't generally hard on drill bits.

To drill the rock face, a Gardner-Denver drill was mounted on an Air Trac carriage. It was powered by a 600-cfm Ingersoll-Rand Gyro-Flo compressor. Also, for putting in some slant holes and down holes, a D8 Cat-mounted Gardner-Denver drill, powered by a LeRoi air-cooled compressor on the machine, also was put to work. Timken and Atlas Copco tungsten-carbide bits in a 3-in. size were used, along with Gardner-Denver Series 1600 and Atlas Copco steel.

In putting in the holes, three 36-ft. deep holes were drilled first, in a

cluster, and then the drill was moved over 7 feet to drill another tri-hole cluster. A series of such clusters was placed across the quarry face, to break down about 45 feet of bank at a time.

Because shooting multi-ton rock out of a solid face calls for real know-how, a method was worked out for rolling the rock out in big chunks, and flattening the banks. It was achieved here by using Giant Extra 20% powder, at an explosive ratio of 0.35 pounds per cubic yard. That rolled the rock out in great chunks, so that it could be split up later like sticks of cordwood.

Splitting the rock was a secondary breakage job, which worked beautifully. An Ingersoll-Rand jackhammer drilled a shallow hole, with the grain, in the bigger rock. As a rule, a two-piece break took care of all but extremely heavy rock. In a few cases, two holes were drilled to break an oversize chunk down to three pieces. Then ⅓ of a stick of powder was placed into the jackhammer holes, and set off. It cracked the rock as clean as if an axe had cut it.

Quarry loading was handled by three heavy-duty power shovels. The kingpin of this shovel fleet was a Bucyrus-Erie 88-B, with a 4-yd. Amsco dipper. It was used to load all large rock in the A-classification. It regularly loaded 32, 33 and 34-ton stones directly off its dipper teeth, and in one case it handled a 39½-ton rock.

On the loading line also was a Bucyrus-Erie 71-B shovel, carrying a 3½-yd. Bucyrus-Erie dipper. It was used for loading 10-20 ton maximum size rock, and for handling B and C-type materials. The third machine, a Northwest 80-D with a 2½-yd. Esco dipper, was used for loading C rock.

Heavy hauling units served as companions to these shovels. Nine International Payhaulers were put in the line, and on some of the off-highway hauling, carried loads up to 59.5 tons. Three Euclid S-18's with Athey rear dump bodies also were brought in, and on their off-highway hauling, they carried payloads up to 65 tons.

Protect Bodies

These big units took a terrific beating, of course, because nothing is harder on a heavy-duty truck than loading rock of this size. Some of the shock was minimized by rolling the biggest rock in, with the bed partly raised, and by using every conceivable type of caution. Frames had to be strengthened, special bumper blocks were placed on the back so that dump hoists couldn't be jerked out to the very end of the piston travel, and truck hoists were further protected by not dumping loads of large A-rock. Big pieces were unloaded directly at the jetty by a rock grapple.

The quarry site is only 2½ miles from the jetty site, and with the exception of a quarter-mile of 11% downhill hauling to the valley floor, it's all level. It was possible to keep most of the hauling with Payhaulers and Athey rear dumps off the highway, so that very heavy payloads were the rule.

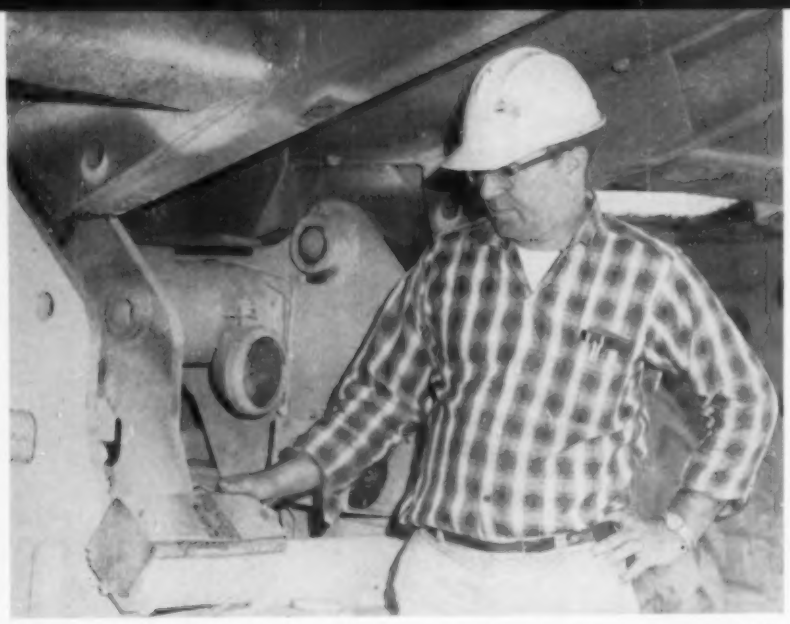
Some hauling was done by S. D. Spencer under a hauling subcontract, over part of the state highway system, for the start of the north jetty. In this case, conventional dump trucks were used with the beds simply set on the truck bodies and not fastened. Thus it was possible to pick up loads of rock, truck bed and all, and swing them to position with the placing crane.

No system of high quarry production is any better than the disposal rate of the rock when it reaches the jetty. Realizing this, Conley and Dennis searched for some manner of handling both big and small rock, preferably with one dependable machine. It would minimize congestion at the jetty, reduce investment in more than one rig, and cut the number of machines dependent on one another.

The choice here was a model 4000 Manitowoc, with 70 feet of boom and a set of 20-ton McCaffrey rock tongs. These two-point tongs, originally equipped with teeth, were changed to solid points and hardfaced with Amsco manganese rod. The tongs were used to lift all heavy A rock from delivery trucks, and to place all rock in an interlocking position on the jetties. They also handled some of

Aerial view of jetty construction shows how a break was left in north jetty. After this was closed, the river was dredged out between the jetties to scour its own channel.

Project Manager Dallas Dennis, busy at the phone, demonstrates that all of his work isn't necessarily field supervision.



Master Mechanic John Schurter points out a special safety bumper on one of the Euclid haulers. It prevents accidental overextension of the hoist mechanism.

the smaller size stones occasionally.

B and C rock was end dumped by the trucks. To minimize maneuvering on the jetty crest, the contractors went to Wickwire cable specialists in Oakland, Calif., and had a 24x24-ft. cable cargo net built for handling loads of smaller size rock. The finished net had a perimeter wire of 1¼-in. cable, and interior wires of 1⅛-in. cable. As the rock laying net wore, repairs were made by lacing used lengths of cable through the net bottom, and fastening them with Hubbard clips. Frayed ends were burned off with an oxy-acetylene torch.

The jetties were built in a single complete operation, placing all three types of rock as the fill progressed. Batter boards were used to establish true slope lines, and an excellent job of "bricklaying" was done with rock weighing well over 10 tons. One of the jetties was built part way from a stub end on shore, and discontinued when the Rogue River currents began to scour excessively. Since the other portion also was available by a haul road from shore, it was finished, and as a final stage, the closure was made, working from the seaward end back toward shore.

View of quarry shows a 4-yd. 88-B and a 2½-yd. Northwest 80-D shovel teamed up for loading. Contractor worked out a special blasting method for rolling out the rock in great chunks.

At that stage, the Rogue was at the season's lowest level, and most suitable for a closure to be made in 40 feet of water.

John Schurter of the G. D. Dennis organization has seen his company do many tough jobs, highway and otherwise, since it started business. But never in his recollection has there been an equipment maintenance job to do which outranked this one in importance. Dallas Dennis wasn't the only man who put in long hours here. Schurter put in many a 15-hour stretch directing his 12-man mechanic crew, and making sure equipment stayed on the production line because there were no spares, as there sometimes are.

A job of this kind can be measured, in a way, by the amount of welding rod used. Schurter figured it up one day, at an average of 350 pounds a month for this job, and it totalled more than the Dennis firm had used since it started in business. That's a fairly accurate index of the maintenance picture.

The 88-B in the quarry, as a key machine, had to stay on the production line. It can truthfully be said that everything else on the job depended on that machine. Yet, despite the fact that the rugged work required an abnormally high amount of preventive maintenance, the total repair bill on the 88-B for 15 months of operation was only $2,500.

Flexible Piping

Many solutions were found to reduce breakdowns. One of the most important was a general replacement of the fixed, rigid piping in the S-18 Euclids and the International Payhaulers with high-pressure, flexible Aeroquip hose and fittings. There had been a bad problem with shock breakage of high-pressure rigid piping, as heavy rock was dumped. When one of the lines broke inside the upper scraper housing, it was necessary to take a face plate off, and find a mechanic small enough to crawl into the tight spot to make repairs.

When the changeover to flexible Aeroquip hydraulic hose and fittings was made, breakage stopped. It

Using Hubbard rope clamps, crane operator and his oiler repair the net of wire rope cable for placing smaller rock.

hasn't been repeated since, and lines up to 2½ inches in diameter were finally used, at working pressures up to 2,000 psi, according to John Schurter and Dallas Dennis.

Schurter also rigged up special steel-and-oak bumper blocks for the truck beds to stop against before the hoist piston could slam out full length and damage itself. In the early stages of the job, before this was done, hoist damage jobs were costing $1,600 each. The bumper block stopped the damage, and was later improved on by adding heavy rubber.

Routine maintenance, always important, started with fueling and lubrication. This was done by mobile service rigs. In all preventive hardfacing, Amsco manganese welding rod was used. The beads were run crosswise from the direction of abrasion. Four Lincoln welders, three of which were 400-amp machines, were used.

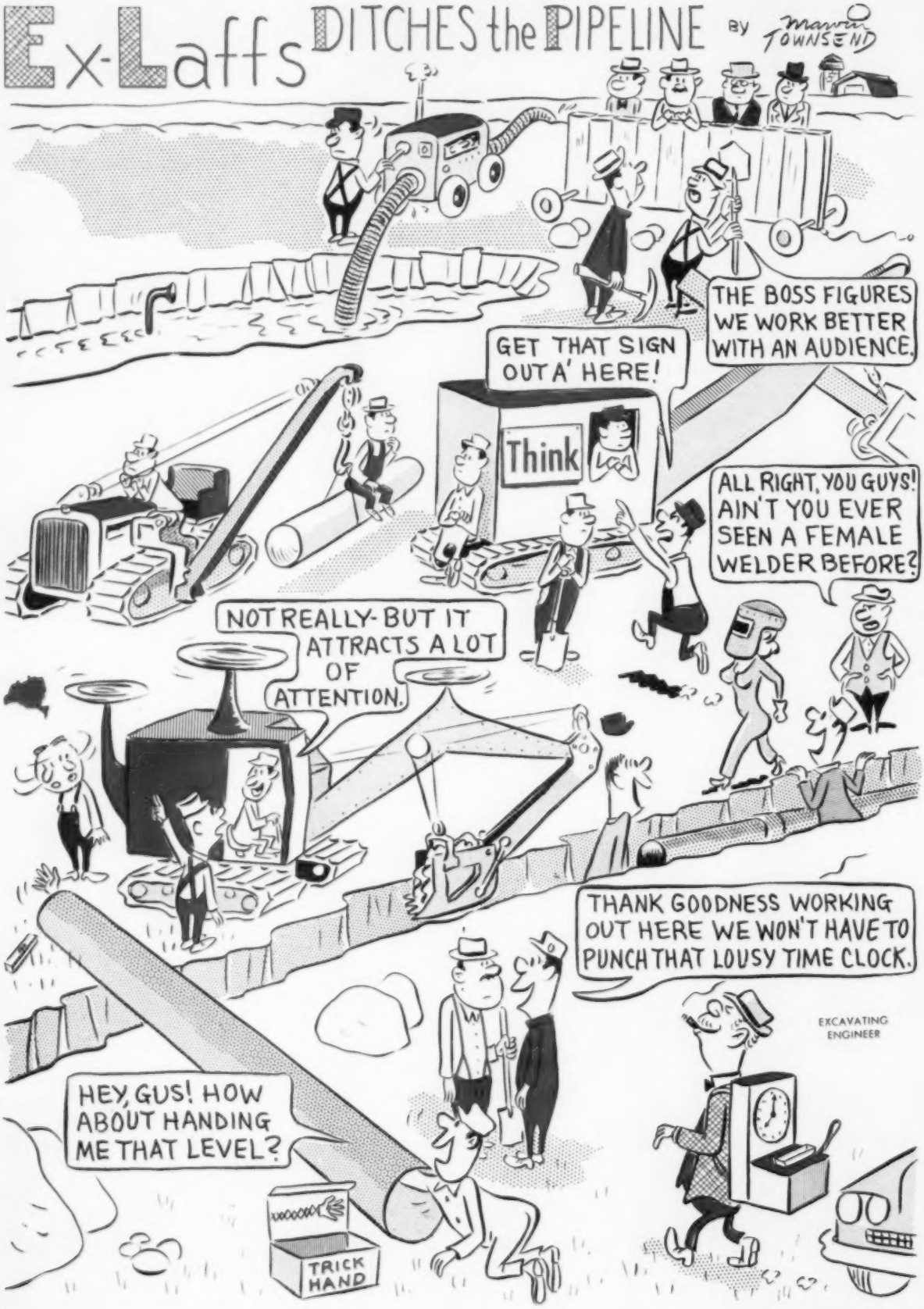
Maintenance and repair operations were night-long. It had to be that way, because every piece of equipment had an important job to do to make the production team work. Operators always had a chance to talk to John Schurter as they left work for the shift, and notations about incipient breakdowns could also be made on their daily work reports. Schurter and his men followed up promptly, to head off breakdowns before they could start.

The payoff—a job built nicely, completed ahead of time, profitably. And, because the contractors had faith in the quarry-rock supply, the government saved money, too.

Assisting Dallas Dennis, in addition to Master Mechanic John Schurter, was Quarry Superintendent Lee Prock.

For the Corps of Engineers, the job was under the general supervision of John Kemple, chief of the Construction Division, with William Owens as coastal project engineer and E. B. Oliphant in charge as chief inspector.

(Left) **Payhauler dumps a load of rock into the transfer net at the Manitowoc machine which serves the jetty-building area.** ***(Right)*** **Load of rock is swung over to placing position by the crane. The rigging lets the net be dumped easily.**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HEY, GUS! HOW ABOUT HANDING ME THAT LEVEL?
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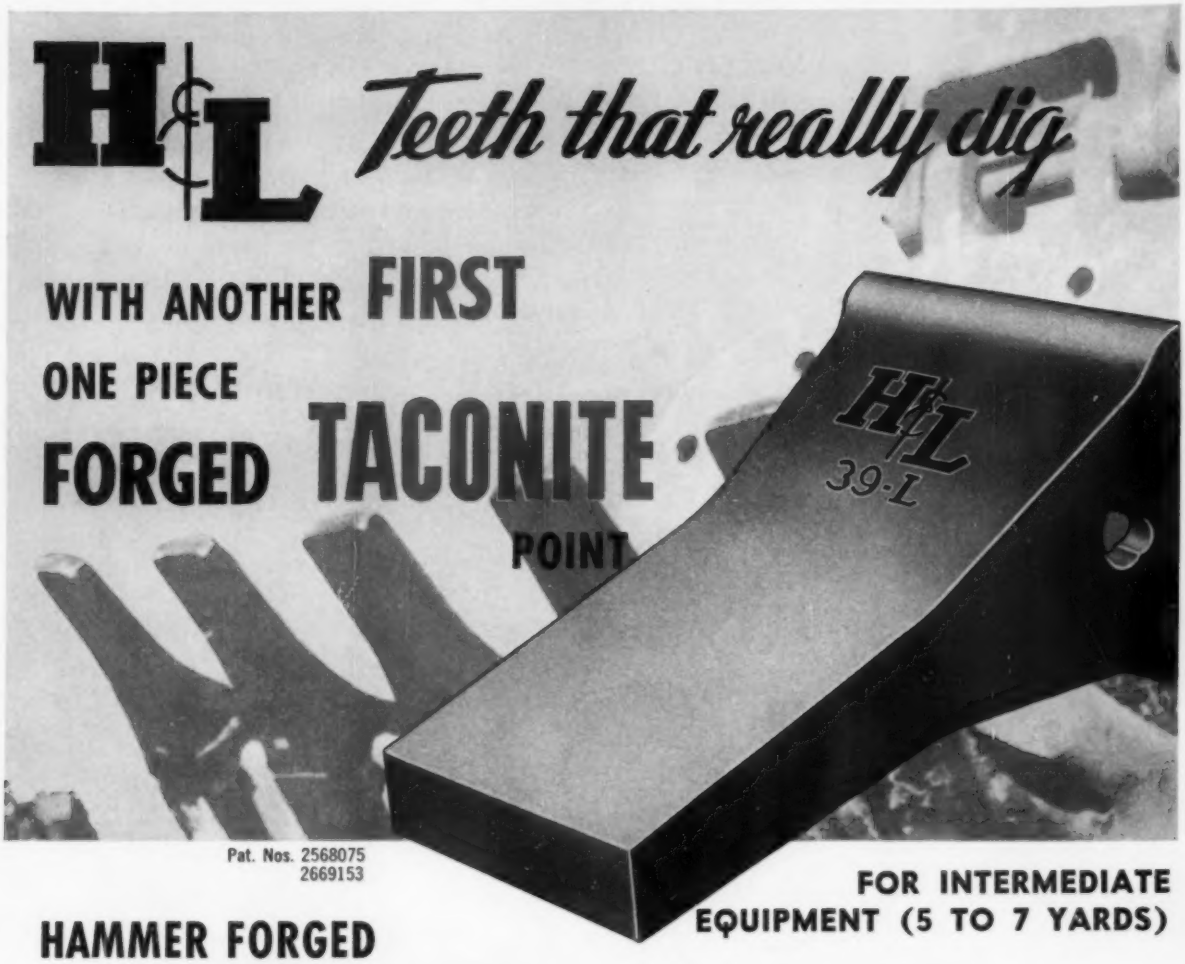

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New CAT 630 and 631

Now power is put to real work with a combination of new concept in power shift transmission and all-new engine—designed and teamed to fit the power to working conditions. This tailored power train, together with unit construction, greater scraper capacity, air-actuated cable control, and new tires makes the 630 and 631 the ultimate in wheel tractor-scraper design!

POWER SHIFT TRANSMISSION

9 speeds with just 3 shifts. This new concept in power shift transmission automatically adjusts the machine to job conditions. Key to this system is a unit mounted directly behind the engine, which combines a planetary gear set with a torque converter so as to provide power to the three speed-range transmission on the rear of the main frame, in one of three ways: (a) torque divider drive (a combination of 75% direct, 25% torque converter); (b) direct drive; (c) overdrive. Result: nine different speed variations—*but* the operator need only concern himself with the three speed ranges controlled by his one lever. (A safety latch prevents accidental engagement.) The rest is completely automatic, governed by a simple mechanical-hydraulic system. Here's how it works:

Operator moves the lever to position *1*, first range, to start the machine down haul road. The machine is now in torque divider drive for easy start and greatest rimpull. As speed increases, converter is no longer required, so the transmission shifts *automatically* to direct drive. When haul conditions permit, the transmission automatically shifts to overdrive.

As speed increases, the shift indicator dial shows operator when to shift to second speed range, *2*. Again the transmission automatically goes into torque divider drive and smoothly picks up the load. As before, when conditions permit, it automatically shifts to direct drive and then to overdrive. This same cycle can be repeated in third range.

Downshifting is automatic too. As transmission senses increasing power needs, it shifts down from overdrive to direct drive to torque divider drive. When conditions require it, the indicator will tell operator when to select the next lower speed range.

Once back in the cut, operator shifts to load position, *L*. This locks the transmission in torque divider drive of the first speed range.

That's Caterpillar's new concept in power shift transmission, designed specifically for these new machines . . . designed to make them more efficient by making the operator's job easier.

ALL-NEW 420 HP CAT ENGINE TAILORED TO POWER NEEDS

Designed for the 630 and 631, this six-cylinder, 5.4″ bore x 6.5″ stroke D343 Engine is turbocharged and aftercooled. It develops 420 HP maximum (335 HP at the flywheel).

Typical of the newness is head design. The engine is parallel ported with dual intake and exhaust valves for most efficient air system. The overhead camshafts eliminate rocker arms and push rods. And the new shelf head design results in fast coolant circulation for outstanding heat dissipation.

Besides these and other new features, the engine offers the economies of the proven Cat fuel system with precombustion chamber . . . burns No. 2 fuel oil—premium diesel fuel not required . . . pressure ratio controlled turbocharger for optimum air flow throughout the engine operating range . . . aftercooler for greater air density for more complete combustion.

New 29.5 x 35 Tires. This all-new tire size was originally developed for the 630 and 631, to provide the best combination of size, capacity and rideability at the lowest cost per yard. These tires were job-proven by tough tests.

New Scrapers. Matching 28 cu. yd. heaped (21 cu. yd. struck) scrapers feature increased capacity, better loading. Sheave bearings now have 125-hour lubrication period. Other trailed units are also available.

New Cable Control. Live power provides control whenever the engine is running. Air-actuated controls cut operator effort in half, retain "feel" of control. Improved cable savers prevent breakage due to double-blocking.

Improved Steering. New two-jack steering makes the 631 easy to maneuver, yet retains "feel" of the road. Improved steering for the 630 absorbs shocks outside the steering gear, provides easier handling in tight quarters.

match power to job conditions—automatically!

3 SHIFTS—9 SPEEDS

FULL UNIT CONSTRUCTION—EASIER SERVICING

Transmission Units. Range transmission is case mounted for accessibility, can be removed as a unit with cable control and differential carrier. Another timesaver: torque divider transmission is removable as a unit without disturbing the engine. Transmission control units are accessible without disturbing the transmissions.

New Radiator-Fan Unit. Fan is shroud-mounted on the radiator for more efficient cooling. Now radiator, side plates and fan can be removed as a unit for servicing—or to provide easy access to the front of the engine.

Servicing Timesavers. Dash swings to expose side of 631's engine. Crankcase guard pivots for access to bottom of engine. For easy tire removal, fenders tip forward on 630, are easily removable on 631.

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Power Shift Transmission

31.2 MPH

28 cu. yd. heaped
(21 cu. yd. struck)

DW21

345 HP (Maximum Output)
5-speed Constant Mesh Transmission

22.6 MPH

27 cu. yd. heaped
(19.5 cu. yd. struck)

619

225 HP (Maximum Output)
6-speed Constant Mesh Transmission

30.2 MPH

18 cu. yd. heaped
(14 cu. yd. struck)

High producers on long hauls

NEW 630

420 HP (Maximum Output)
Power Shift Transmission

41.5 MPH

28 cu. yd. heaped
(21 cu. yd. struck)

Optional 482 Series C Scraper
35 cu. yd. heaped
(27 cu. yd. struck)

DW20

345 HP (Maximum Output)
10-speed Constant Mesh Transmission

35.8 MPH

27 cu. yd. heaped
(19.5 cu. yd. struck)

For more complete information about new Cat Wheel Tractor-Scrapers, ask your Caterpillar Dealer.

Caterpillar Tractor Co., General Offices, Peoria, Illinois, U.S.A.

CATERPILLAR

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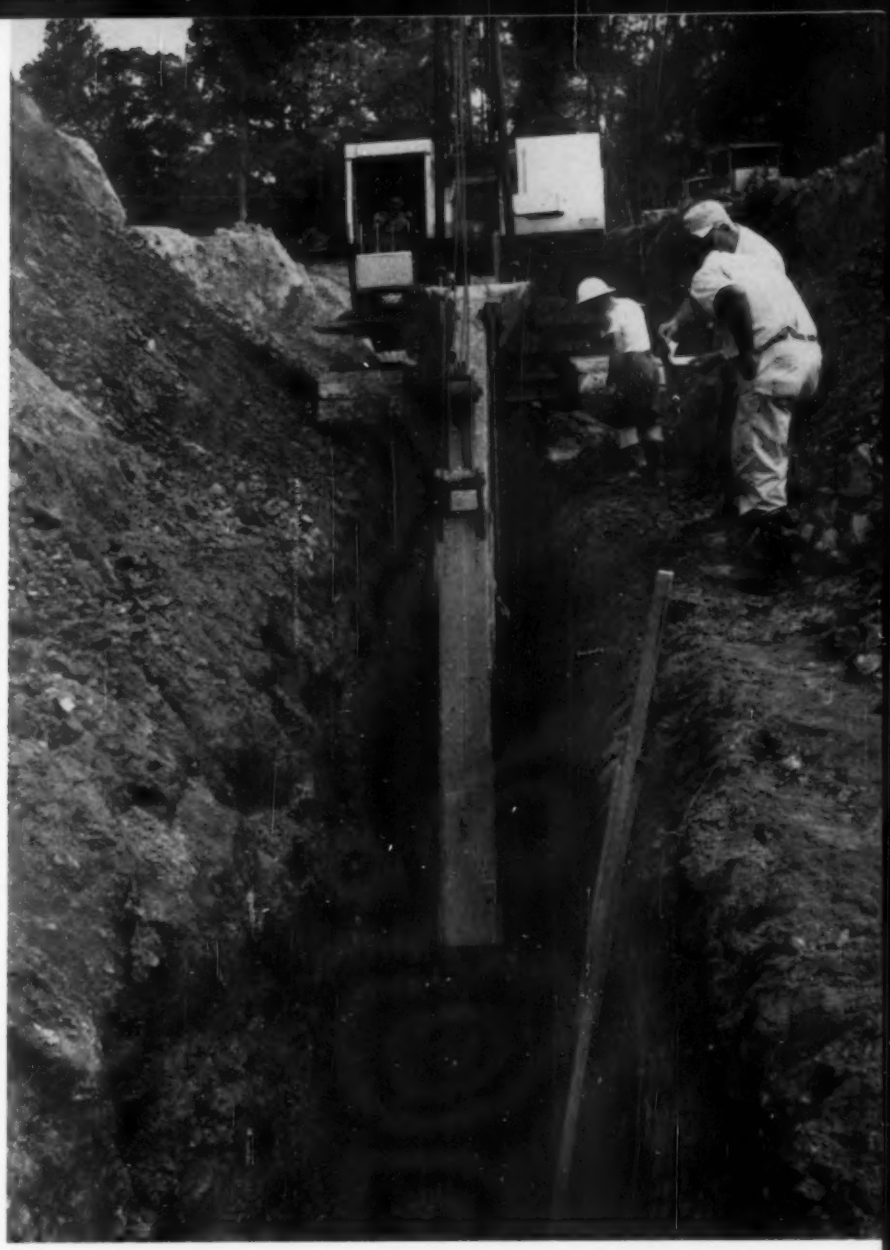
**ADVANCED AS TOMORROW
—CERTAIN AS YESTERDAY**

High Speed on a Deep Sewer

On a job that includes some of the deepest cuts ever logged in New Jersey, contractor sets a flashy pace.



How's this for boarding-house reach? The hoe cuts a clean trench in the shale with its 48-in. wide dipper. Depths run up to 15 feet here; go down as far as 27 feet elsewhere on the job.

IN the fields outside Trenton, N. J., where George Washington took on the harassing British troops—and beat them—Sam Giordano's small force fought a tough action of its own last summer. Their enemy—the tacky clay and tight sandstone that ordinarily mean slow progress on a deep sewer line. Their strategy—frontal attack on the stubborn subsoil spearheaded by digging power, with a blitzkreig pipelaying spread close behind.

Giordano, part-owner of G & D Construction Co. and field boss on the job, feels he won his battle, too. Records back up the claim. One day's advance totaled 500 feet of finished sewer—and at that, the crew ran out of pipe at 3 o'clock in the afternoon. Even in trenches up to 27 feet deep, the spread stayed at a hot pace.

G & D has a good piece of a sanitary sewer program backed by the Ewing-Lawrence Sewerage Authority. Phase I of their contract included 11,300 feet of pipe for an interceptor line. This one produced the deep trench and tough digging. Phase II, started in late summer, calls for 38,400 feet of mains and service lines in the village of Lawrenceville. Although the going is easier here, G & D patterns work on the plan that pushed progress of the interceptor.

Heavy-Duty Spread

The spread took shape as a heavy-duty task force. The basic machines were a hoe for digging and a truck crane for pipe handling and other lifting chores. A dozer cleared trees and brush ahead of the hoe, and backfilled the trench behind the pipelayers. To provide a ready source of concrete for manhole footings, G & D took along a portable mixer.

Giordano kicked off the interceptor contract with the longest run—just over a mile of 15-in. diameter pipe. To get around drainage problems in the open trench, the men dug "upstream" from the low point of the section. Easy cuts and open terrain gave the spread a chance to sprint here, and to sharpen digging techniques for the heavy going later on.

They got one break. Most of this stretch ran through open fields and patches of timber, which provide more elbow room than normal on a

This section uses a two-stage cut. Hoe first strips dirt down to the rock surface. Then it comes back through to cut vertical trench walls. Spoil from the trench goes on the floor of the first-stage cut. Pipe is already strung along the trench.

sewer job. As it panned out, Giordano was glad to take all he could get. Some sections ended up as two-stage cuts.

Giordano points to his 1-yd. hoe chewing rock at the end of the long trench as he talks candidly about handling of the big cuts.

"The idea is first to strip the dirt down to the rock surface," he explains. "Then the hoe comes back through and cuts vertical trench walls to grade. You see, with the dirt out of the way there's no danger of cave-ins.

"Sure, we have enough digging power to pull it right down to the invert in one pass most places," he continues. "Doing it that way, though, sometimes takes longer than opening this first-stage trench so the hoe can take on the rock in the range where digging is fastest."

The hoe makes a generous first pass —about 40 feet wide. This layer of topsoil and sticky clay runs just under 12 feet deep. That means the hoe handles about 17 cubic yards of dirt for each linear foot of first stage trench it digs.

Why the wide trench? Giordano figures it this way: It pays off in digging speed when the hoe goes back for the second lift. After all, the rig needs room to swing its rear end, and also space to build up a spoil pile. Without the wide work area, spoil might have to be rehandled to get it up to ground level.

Here's how the big job runs. A Cat D8 makes a pioneer run along the sewer route, pushing aside brush and trees. The dozer also levels a swath to give the hoe stable footing.

The hoe then opens a starting cut and quickly develops it to full depth of the overburden. Wielding a 48-in. wide dipper, the rig comes up with a heaping 1½-yd. payload each swing. The operator throws the spoil high. He uses the hoe's boarding-house reach to build a tight windrow. All spoil goes off to one side of the trench. The other side is kept clear for easy access by the pipelaying crew.

Final Cut Tough

With the first-stage trench finished through the hillock area, the hoe backtracks for the final cut. No easy digging now. Each foot of progress is a grinding, tearing struggle between the hoe and the tight shale and sandstone. The operator uses the dipper like a giant crowbar. The bottom batters and smashes the rock. The teeth pry loose stubborn pieces.

The rock gives way reluctantly, but the digging advances at a steady pace. The 48-in. wide trench reaches depths of 15 feet in the rock. That's 27 feet below the ground surface, one of the deepest sewer trenches ever reported in the state.

Where needed to provide firm support for the pipe, an 18-in. layer of crushed stone (minus 1½-in. size) goes on the floor of the trench. Then the men lower in special concrete cradles that fit under each pipe joint.

The pipelaying crew is a joy to watch. They have their job down to a science, with no waste motion allowed. Sections of vitrified clay pipe are strung alongside the trench well ahead of time. As the spread advances, a ground man wipes and soaps the Ty-Lox rubber compression joints. That's all it takes to get this pipe ready.

Pipe Sets Tricky

A truck crane lifts each section with a simple wire rope sling (the pipe weighs about 700 pounds per 4½-ft. piece). Slowly the crane inches the pipe down into the trench. The rig rides up at ground level, so the operator can't see what's going on. Giordano stands at the brink of the rock trench and directs his moves. The crane's 60-ft. stick gives plenty of reach for safe spotting of the pipe.

In the trench, the men grab the pipe and square up its spigot end with the bell of the adjacent section. Then they ram the new piece home. In seconds the joint is complete, tight and permanent. No messy caulking or down-in-the-hole fuss with this self-sealing compression joint. In fact, the whole cycle—lower, join and brace a pipe section—takes less than a minute.

The crane never has an idle moment. When pipelaying lets up a bit, the operator swings the rig around to give the concreting crew a hand. Footings for the manholes on the line are all poured in place.

The men produce just as much concrete as they need in a CMC mixer that wheels right up to trenchside. The mix chutes directly into a Gar-Bro bottom-dump bucket. Then the crane spots the bucket right over the forms for a fast and easy pour.

The D8 backfills the line as soon as the pipe is set—usually at the end of each shift. Dirt pads the top of the pipe, and then the rest of the spoil goes back into the trench. A layer of topsoil makes the finished job neat.

(Left) **Worker wraps a sling around the pipe section prior to lift. Plastic compression joints speed laying of the vitrified clay pipe. They are wiped and soaped before use.**

(Right) **Sam Giordano, the "G" in G & D Construction Co., is a working boss. Here he directs the crane operator as a pipe section disappears into the trench depths.**

In Unity There Is Economy

HOW can small communities beat the problems of financing badly needed sewerage systems?

"Gang up on them," suggests William H. Higgins, engineer-manager of the Ewing-Lawrence Sewerage Authority. A fine case study of such joint action, the Authority turned wishful thinking into digging contracts for two New Jersey townships.

Ewing and Lawrence, both small townships in Mercer County, faced similar sanitary troubles. Overflowing septic tanks polluted streams, some of which fed the Delaware River, a source of water for downstream cities. The growth of whole new subdivisions just pointed up the serious health menace.

Early Failures

Early attempts to go it alone convinced the township burghers that it paid to join hands. That way they saved duplicate staffs to engineer and run the system. Together, they could build a first-class modern treatment plant.

The Authority was formed in 1947, with three members from each of the townships. Buck, Seifert & Jost, New York City consultants, took over the engineering chores. Backed by sewer rental guarantees, the Authority borrowed money to build the treatment plant and 80 miles of collecting sewers.

The current work will bring sewers to over 2,100 more homes in the two townships. Meile-Salvatore Co. has the contract in Ewing—an 18,400-ft. long interceptor line. The Lawrence Township interceptor, described in this article, consists of 11,330 feet of 12 to 24-in. diameter pipe.

Here's an interesting sidelight on the G & D Construction Co. contract. The Lawrenceville interceptor line they are building will serve a 1,000-acre area zoned for research—a growing "industry" in this locale. The research outfits will occupy 25-acre-minimum plots in a park-like setting similar to the industrial parks now springing up in suburban areas.

Each piece of the 15-in. pipe weighs 700 pounds, but it takes only minutes to ram the pipe home for a tight permanent joint. Meanwhile, Carter Humdinger pump controls water seepage.

BIGGEST VALUE

The modern Allis-Chalmers HD-16 crawler tractor has the horsepower, weight and drawbar pull needed to handle most tractor jobs on your big spreads. With it, you stay in the same horsepower class as the biggest tractors available a few years ago and save the extra cost of moving up to "extra big" machines.

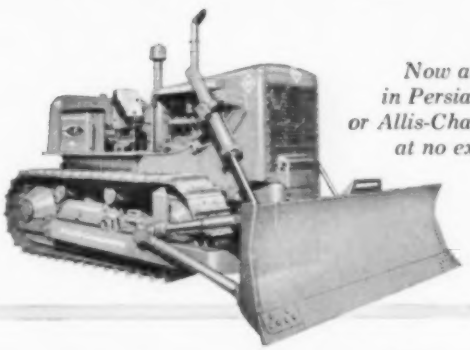
Look at the HD-16 . . . watch it work . . . compare it to any other crawler and you'll be convinced that, dollar for dollar, you can't buy a bigger producer. Here is an up-to-date power package that converts up to 150 hp at the flywheel to as much as 60,000 lb of drawbar pull. With bulldozer, more than 19 tons of "live-action" weight go to work moving material more profitably than any of your older "big" tractors.

With today's HD-16's, you maintain the power balance of your spread and add greater ease of operation and maintenance that keeps building production

. . . move ahead with

IN 150-HP CLASS

for you. Whether you are replacing outmoded tractors or moving up to more power, you will find it to your advantage to check the tremendous working range of the low-cost, big tractor—the Allis-Chalmers HD-16. See these advantages in action: *industry's healthiest engine . . . toughest track ever built . . . torque converter or all-gear drive . . . permanently lubricated truck wheels, idlers, rollers with tapered roller bearings.* Call your Allis-Chalmers construction machinery dealer for a demonstration. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.



Now available in Persian Orange or Allis-Chalmers Yellow at no extra cost.

ALLIS-CHALMERS

power for a growing world

NEWS FROM THE FIELD

A 140-ft. wide "mat puller" equipped with special 5-ft. high tires moves a concrete block mattress, or revetment, into position on Mississippi river bank.

Concrete Mattresses Protect River Bank

Along the banks of the Mississippi, an ungainly mechanical monster with 28 "feet" fights that mighty river's cannibal habit of chewing away its own shore line.

The giant vehicle—called a "mat puller"—is used by the Army Corps of Engineers at Vicksburg, Miss., in revetment construction, the placing of concrete block mattresses along the river's lower banks. Each of the mattresses is 140 feet wide and 500 feet long.

Built in seven sections, the mat puller is as wide as the mattress, which is formed by connecting blocks with imbedded copper-covered wire fabric.

Equipped with unique Terra-Tires built by Goodyear Tire & Rubber Co., Akron, Ohio, to "go anywhere," the mat puller sloshes into the water to meet a launching barge that delivers the mattress. After the mattress edge is linked to the mat puller by cable and hooks, the puller is winched up the river bank until the mattress reaches its designated resting place.

Revetments usually are placed along a bend in the river. Before the development of the mat puller, engineers could not position the square-shaped mattress high enough on the crescent-shaped bank to allow effective bonding with the upper asphalt paving. As revetments continued to fail at the river bends, maintenance costs soared.

The first mat puller was equipped with steel drums that caused it to break the concrete blocks as it rolled back over them after placing the mattress, and also required excessive strain on the winches.

Terra-Tires, which require only five to six pounds of pressure per square inch and exert only slightly more pressure than that on the ground, enable the mat puller to "tip-toe" over the concrete blocks.

Appoint Road Show Publicity Co-Chairman

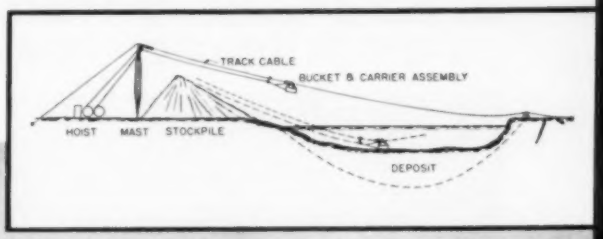
Donald V. Buttenheim, president of the Construction Industry Manu-

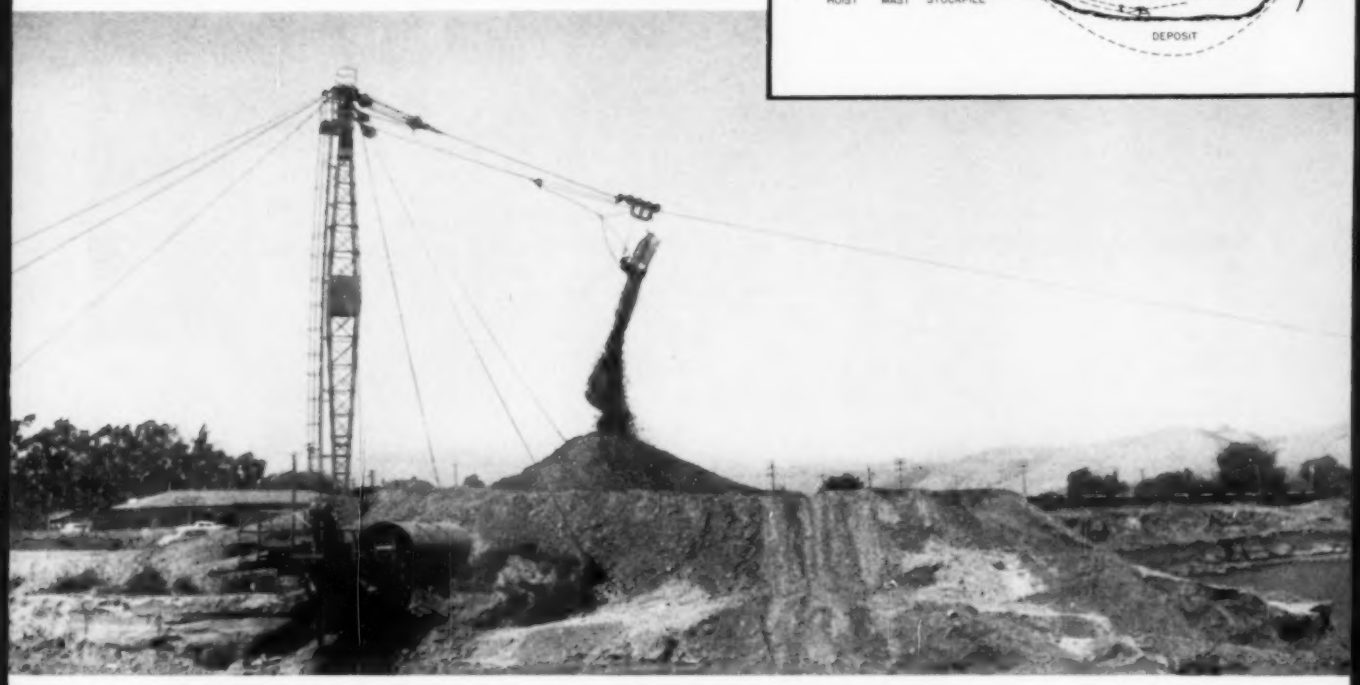
Continued on page 36

A five-mile section of highway 190 near Baton Rouge, La., is being widened to four lanes, with a Koehring Skooper owned by Barber Bros. playing an important role. The Skooper shaves off the old pavement without disturbing the subgrade.

GET ALL THE MATERIAL OUT OF YOUR PIT

A Sauerman Slackline Will Recover It For 6 Cents A Ton





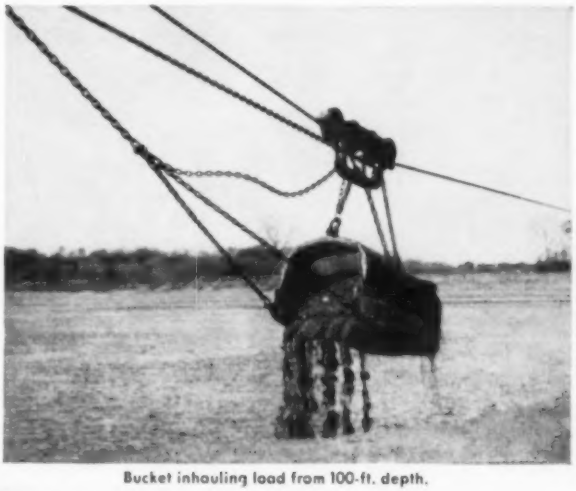
Plants Like This Are Turning Hard-To-Reach And Deep Materials Into Increased Profits

One way to beat increasing land values and depleting resources is to get all the material out of your present deposit. You can do this with a Sauerman Slackline Cableway. The machine starts at ground level and continues to work at depths and distances that cannot be reached with other excavating equipment. A Slackline will dig 100 feet below water and haul loads over 1000-ft. spans.

A Sauerman Slackline beats rising operating and labor costs, too. It provides what is probably the most economical of all excavating and hauling methods. Operating costs as low as 6 cents per ton for labor, power and maintenance are frequently reported.

Another advantage of the Sauerman Slackline is that it can be operated continuously in all types of weather. This permits building a ready stockpile to meet seasonal or unforseen demands.

If you are starting a new plant or updating an existing one, do it with the machine that gets the most out of your deposit at lowest possible cost. Sauerman Slacklines are built in sizes up to 3½ yds. to match your tonnage requirements. Write or call about your deposit. We'll recommend the proper machine.



Bucket inhauling load from 100-ft. depth.

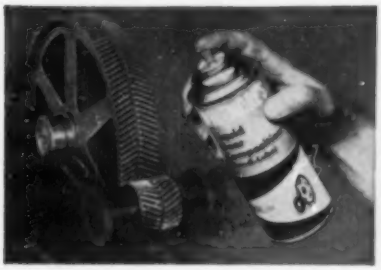
SAUERMAN BROS., INC.

622 So. 28th Ave., Bellwood, Illinois
Linden 4-4892 • Cable CABEX—Bellwood, Illinois

Crescent DragScrapers • Slackline and Tautline Cableways • Durolite Blocks

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!



HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal —no breakdown even after prolonged use under water—available for every climatic condition—packaged in handy 16-oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300% —special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

65 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

- Open Gears, Dipper Sticks, Cams
- Enclosed Gear Cases
- Wire Rope and Cable
- Hydraulic Units, Torque Converters
- Roller, Ball, and Sleeve Bearings
- Speed Reducers

Est. 1893

THE WHITMORE MANUFACTURING CO.

LUBRICATING ENGINEERS

CLEVELAND 4, OHIO, U.S.A. PHONE: VULCAN 3-7272

News . . .

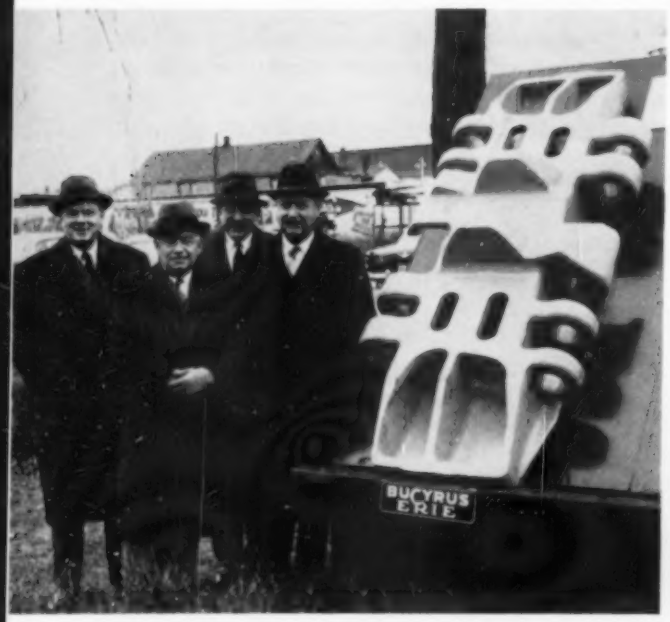
Continued from page 34

facturers Association, has announced the appointment of Harvey A. Scribner as co-chairman of the publicity committee for the coming Construction Equipment Manufacturers Exposition and Road Show. Buttenheim is publicity chairman.

Scribner is president of Russell T. Gray, Inc., Chicago, an industrial advertising agency. He has served many times as a member of the publicity committee for previous Road Shows and twice as chairman of the publicity committee ('48 and '57).

H. A. Scribner

The Construction Equipment Exposition and Road Show is to be held under the sponsorship of the American Road Builders Association, the Associated General Contractors of America, the International Road Federation, and the Associated Equipment Distributors. It will be presented and staged at the International Amphitheatre in Chicago by the CIMA February 23—March 1, 1963.



Merl C. Kelce *(right)* and F. Stillman Elfred *(second from left)*, president and board chairman respectively for Peabody Coal Co., St. Louis, Mo., were guests of Bucyrus-Erie Co., recently. During their tour of South Milwaukee (Wis.) shop facilities with Robert G. Allen *(left)* B-E president, and Howard Freyensee, large machine sales manager, Kelce and Elfred got a look at a massive 3,700-lb. crawler link—the first of 296 cast links to be used in construction of four sets of dual crawlers for a giant 115-yd. stripping shovel being built for a Peabody mine in western Kentucky. The heat-treated chrome nickel alloy link is $7\frac{1}{2}$ feet wide with a $28\frac{3}{8}$-in. pitch and 11-in. wide roller path. In operation, the 8-ft. high crawlers will have to support and move over 14 million pounds of machinery, towering 220 feet high.

BY CHOICE
...not by chance!

More operators specify Hendrix Dragline Buckets

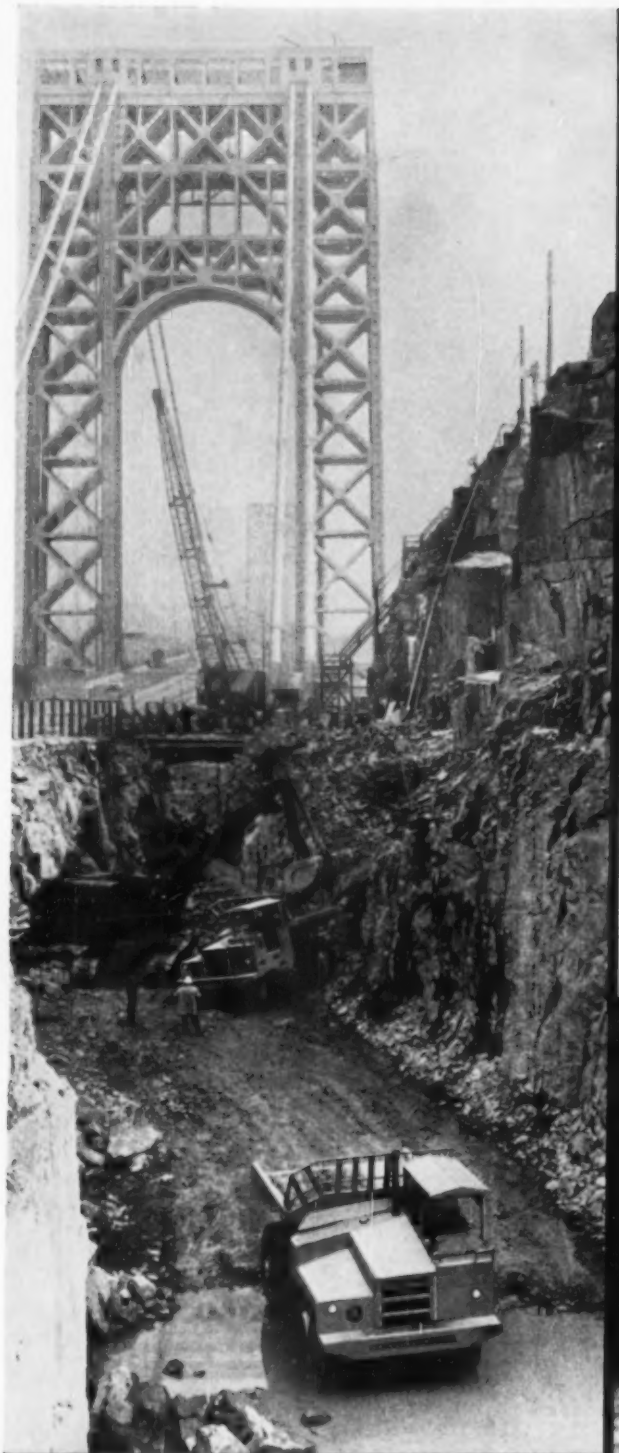
"A Type for Every Digging Purpose"...
¼ to 40 Cubic Yards-Perforated or Solid

Hendrix Lightweight DRAGLINE BUCKETS

HENDRIX MANUFACTURING CO., Inc.
MANSFIELD, LOUISIANA

Where there's Model 100

DUMPTOR CUTS HAUL TIME IN HALF — Matched against another leading rear dump unit, DUMPTOR recently shaved haul time in half for one operator. Job involved a 603-ft. one-way haul, 204 feet was down a 20% grade. Average trip time: 1 minute, 38 seconds.



DUMPTOR SPEEDS NARROW ROAD CUT — George Brewster & Sons, Inc., use DUMPTORS to haul rock for construction of approach ramps to lower level of George Washington Bridge. In places cut is so narrow it prohibits turn-around operations — no problem for dual-controlled DUMPTOR.

MINING ABOVE GROUND AND BELOW — Cramped-quarter underground work, and long steep hauls above prove no problem for DUMPTORS in Canadian copper mine.

no room or time to turn DUMPTOR® outhauls all others

HAULING DOLOMITE IN AFRICA — This DUMPTOR is at work in a quarry near Johannesburg. Job requires a 600-yard haul. Haul time is 2 minutes, 2 seconds. Dump and return time: 1 minute, 52 seconds. DUMPTOR averaged 120 cu. yds. every 50 minutes.

SAND AND GRAVEL SHUTTLE — DUMPTOR is popular in sand and gravel pits, too. Makes quick work of hauling from loader to crusher and screens . . . no need to turn.

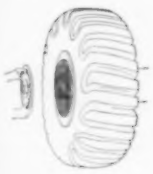
• More trips per shift

Pivoting seat, dual controls for fast, no turn operation. Travels up to 24 mph in either direction. Ideal for working narrow cuts, on grades, and making the most of time on straightaways.

• Bigger payloads

Carries up to 30,000 lbs. Big 10′ x 10′ square body designed to self-center material — assure full heaped loads every trip. Instantaneous or controlled gravity dump.

• Lower maintenance



Planetary drive axles. Shafts, gears, and differential carrier assembly can be serviced without removing wheels or tires. Oscillating steering axle keeps twists and strains of road travel away from main frame. Dump body is heavily reinforced.

GET ALL THE FACTS — see your Koehring distributor soon. Ask him about the Model 60, too! An 8-ton hauler that delivers the same timesaving features as the 15-ton Model 100. KIS EE

KOEHRING
DIVISION OF KOEHRING COMPANY
Milwaukee 16, Wisconsin

NOT in the Contract

A business executive, worried over sales and administrative problems in his company, found himself suffering from insomnia and asked his doctor for some sleeping pills. The doctor gave them to him, but the next morning he was back.

"They didn't help at all," he told the medico. "I want stronger pills."

"But those are the strongest I have," countered the doctor.

"You gave my wife stronger pills when she was pregnant," argued the drowsy-eyed executive.

"Yes," agreed the physician, "but, those were for labor."

"You see," sighed the businessman, "it's just as I've always suspected. Everything for labor, nothing for management."

"Can you send a full length mirror up to my room?" asked the hotel guest.

"But you have a half length mirror up there already," replied the hotel clerk.

"Well, I know it. I've been out twice already without my trousers."

An American congressman was visiting Greece. At an embassy party he was introduced to the popular Greek drink, *ouzo*. After the first glass he noticed the furniture moving around. "This is a powerful drink," he said to the ambassador.

"Not particularly," the ambassador replied. "This happens to be an earthquake."

A stenographer was applying for a new job. On her application blank, she wrote: "I am thoroughly familiar with all important phases of office procedure, including bowling, crossword puzzles, coffee breaks, personal letter writing and collection taking."

Doctor: "Well, young man, your cough is a little better today."

Patient: "It oughta be. I've been practicing all night."

"Would you like to step outside and see the bucket?"

The first hectic sessions of Congress were beginning to take their toll on some of the older senators. One of them, dog-tired after being in committee all day, staggered into the Senate dining room and slumped into a chair.

When the waiter handed him a menu, he pushed it back at the man and said, "Just bring me a good meal."

The good meal was served as directed and the senator gave a liberal tip.

"Thank you, sir," the waiter said, "and if you got any friends what can't read either, just send them along to me."

Boarder: "It's disgraceful, madam. I'm sure two rats were fighting in my bedroom last night."

Madam: "What do you expect for $25 a month? Bull fights?"

A crowd rushed over to a man who had just been knocked down by a St. Bernard dog and then almost immediately was run over by a Volkswagen.

"I didn't mind being knocked down by that animal," the man said, "but that tin can tied to his tail nearly killed me."

Trainman: "This train goes to Philadelphia and points west."

Old lady: "Well, I want a train that goes to Altoona, and I don't care which way it points."

A college weekly carried the following item: "Found, a roll of five-dollar bills. Will the owner please form a line at the north entrance of the newspaper office?"

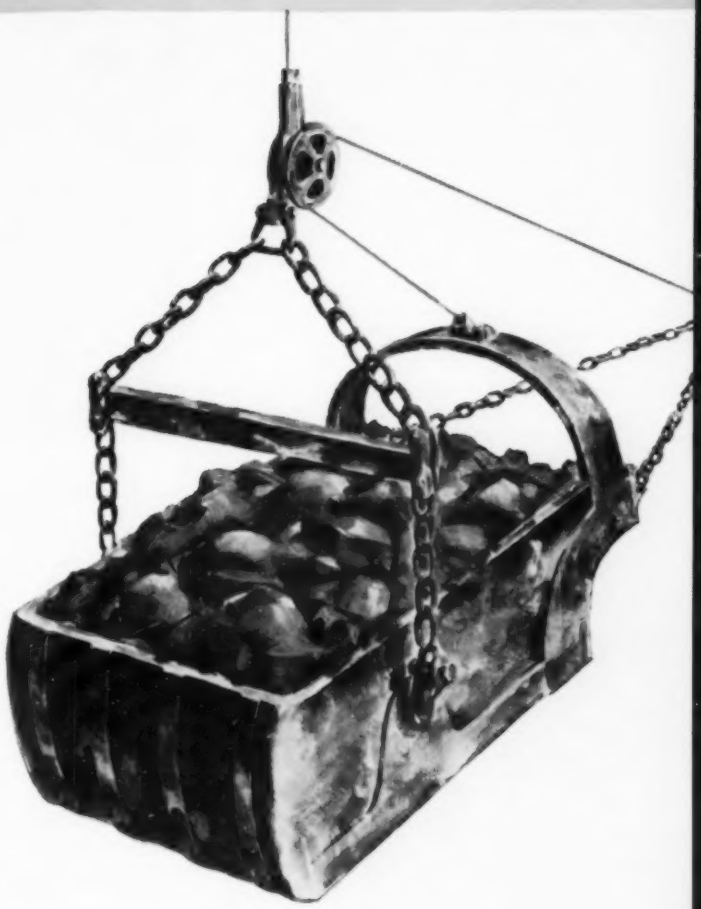
"I see you aren't a gentleman," hissed the woman on the windy street corner as she tried vainly to keep her skirt in place.

"Nope," replied the gawker, "and I see you aren't either."

A New York psychiatrist received a postcard from a vacationing patient. "Dear Doctor," it said. "Having a wonderful time. Wish you were here to tell me why."

engine power
BY CATERPILLAR

How 33,000 psi cuts costs per ton



The heart of a dragline or excavator is its power source

Take the case of the Cat D397, used in the majority of large diesel powered machines. It has a horsepower rating of up to 730. Its 33,000 psi tensile strength block is precision built to provide a strong, rigid framework for all engine parts.

Here are just a few of the other features that make the D397 your best buy for excavator power. Turbocharging gives higher horsepower per pound of engine. Oil is 100% filtered to lengthen overhaul periods and engine life. Non-clogging, single-orifice injection valves let you use low-grade, low-cost fuels with cetane ratings as low as 35. These fuels have more BTU's per pound; they provide more energy per gallon.

Bearings are steel-backed aluminum alloy for high load-carrying capacity and resistance to corrosion and wear. Cat piston assemblies combine light weight in aluminum pistons, high wear resistance in chrome rings and the durability of cast iron in the top ring band. Heat treated, wet liners are full length to give rapid heat transfer, longer ring, liner and lube oil life.

If you could look inside the Cat D397 Engine you'd see additional evidence of quality in the high-strength crankshaft, in precision-ground camshaft, in the efficient cylinder heads and valve train.

Your Caterpillar Dealer is the man to see for complete facts. He'll tell you how you can save more money and make more money with Caterpillar powered excavators. Get in touch with him. It may be one of the most profitable talks you've ever had.

The D397's cylinder block is cast in Caterpillar's own foundry. Careful control, modern processing and rigid inspection all along the line insure a rugged foundation for all engine parts.

CATERPILLAR

Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

Engine Division, Caterpillar Tractor Co., Peoria, Ill., U.S.A.

EQUIPMENT YOU OUGHT TO KNOW ABOUT

Hand-Held Compactor

Manufacturer: Racine Hydraulics & Machinery, Inc., Department EE, 2000 Albert St., Racine, Wis.

Claims: Model improvements to the "Rapak" self-propelled, one-man earth compactor now make it possible to tamp narrow ditches as little as 4 inches in width and up to 40 inches in depth.

This improved Rapak has a one-shot lubrication system built into the head of the machine as an integral part. Longer engine life is offered through a new sleeved, 4-cycle engine and a new heavy duty centrifugal clutch.

The model delivers 450 heavy ram blows per minute and is designed to compact all types of granular as well as cohesive soils.

Land Clearing Rake

Manufacturer: Rockland Co., Department EE, 3788 W. Colonial Drive, Orlando, Fla.

Claims: A new B-series model RF-3 rock, stump and tree-clearing rake has been developed by Rockland for Euclid tractors.

The rake is equipped with teeth which are laterally adjustable and reversible to permit use of both ends. They are guaranteed against breaking and/or bending.

This equipment is available and in production for Euclid C-6 and TC-12 tractors.

A canopy cab is available and recommended for the tractors when they are used for land clearing.

Diesel Engines

Manufacturer: Allis-Chalmers Mfg. Co., Department EE, Milwaukee 1, Wis.

Claims: Allis-Chalmers has expanded its diesel engine line with the addition of a 145-hp naturally aspirated model 10000 engine, and the 210-hp turbocharged 11000 engine (shown on page 43.) Horsepower ratings of both are at 2,200 rpm.

The new engines are six cylinders and have 516-cu. in. piston displacement, $4\frac{7}{16}$-in. bore and $5\frac{9}{16}$-in. stroke. They are produced at the company's Harvey (Ill.) works where they were designed and engineered. Both the 10000 and 11000 are available as either open or closed power units; as off-highway engines; packaged torque converter units; for diesel electric sets; and for marine use. The electric set with the 10000 engine provides up to 66 kw and the set with the 11000 engine up to 110 kw.

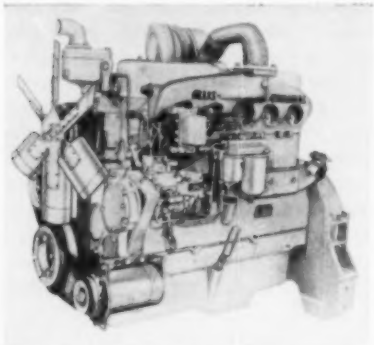
The new engines have been designed to meet the demands from off-highway equipment users, for use in oil fields, construction machinery, mining and quarrying and for sawmill and logging equipment. The diesel electric sets are available for standby and continuous applications.

Fuel economy, easy starting and simplified servicing are among the important features of the new diesel engines. The turbocharged 11000 operates on as little as .366 lb. of fuel per bhp/hr, or up to 27% less fuel than other engines of similar horsepower. The key to this operating efficiency is the Allis-Chalmers direct-injection, open chamber combustion system with controlled turbulence that thoroughly mixes fuel and air for complete, fast and even combustion.

Both new engines have a single plunger type fuel injection pump which accurately times and meters fuel injection. The self-lubricated water pump has a precision floating seal that eliminates packing leaks and serv-

icing problems. Replaceable wet cylinder liners help deliver top engine performance without costly and time-consuming reboring.

Two-stage, fuel oil filters with quickly replaceable elements, filter the



fuel twice. Lubrication oil is kept clean by full-flow type oil filters with built-in by-pass.

Another time and cost saver is the engine's timing strip located on the flywheel. It has reference points which allow easy, yet accurate timing of the engine, whether in the shop or in the field.

Shovel Tooth Point

Manufacturer: H&L Tooth Co., Department EE, 1540 S. Greenwood Ave., Montebello, Calif.

Claims: A new 40-L all-forged one-piece point for shovels of 8 to 9-yd. capacity is now being produced by H&L to meet the increasing demands of the ore excavating field for greater digging service. The point is mechanically forged-to-shape from high nickel alloy steel, and has an extreme resistance to severe abrasion, and can absorb excessive high impact.

By forging, the H&L 40-L point is uniform hardened from core depth throughout the nickel alloy steel, then tempered through a special heat treating process that is electronically controlled in hydrogen-atmosphere furnaces. The tooth resists high impact even in extreme cold climates.

The 40-L has the H&L Flexpin type connection that secures the point to the adapter. H&L Tooth Co. specializes in the manufacture of two-part teeth with associated adapters and shanks.

Tractor-Mounted Backhoe

Manufacturer: Parsons Co., Department EE, Newton, Iowa.

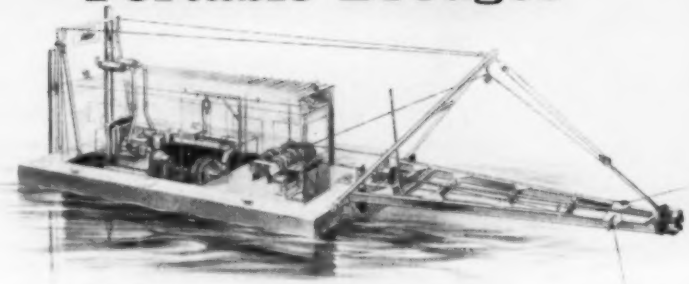
Claims: The Parsons-Shawnee 1500 —largest capacity tractor-mounted backhoe on the market—has been announced by the Parsons Co., manufacturer of trenching machines and utility tractor attachments.

The new hoe has greater digging depth, 15 feet; higher loading height, 12 feet 6 inches; and longer reach, 20 feet 8 inches, than any other tractor-mounted backhoe now available.

The 1500 was introduced at the 1960 Koehring Co. Equipment Show held at the firm's proving grounds near Waukesha, Wis., in late Sep-

Continued on next page

Ellicott "Dragon"® Model Portable Dredges



The Dredges Of Advanced Design Whose Performance Is Proved Not Promised

Here are some of the reasons:

1. These are dredges in which portability is a reality not a possibility. *Patented* 2-piece hull disassembles quickly and can be reassembled on shore or in the water.
2. All components designed and built by Ellicott whose centralized engineering and manufacturing responsibility insures quality control.
3. Products of experience gained by a company which has concentrated on designing and building dredges of all sizes and types for 75 years. *This "know-how" is unequalled by any other dredge builder.*
4. "DRAGONS" are completely electro-hydraulically operated with unified controls to facilitate handling ease, lessen operator fatigue and raise outputs. *This kind of control was introduced by Ellicott on portable dredges over 10 years ago.*
5. All precision machinery easily accessible for servicing. Eliminates costly delay in maintenance of vital operating components.
6. "DRAGONS" which comprise over half of Ellicott's total dredge production are working throughout the world on road construction, land reclamation, industrial anti-pollution and waterway maintenance programs. These are only a small sampling of the projects on which "DRAGON" versatility has been demonstrated.

For further information on the certain efficiency and the economy of "DRAGONS" and what satisfied users have said about them, send for Bulletin 980. Just fill in the handy coupon.

2755

ELLICOTT DREDGES

ELLICOTT MACHINE CORPORATION, Baltimore 30, Maryland, U.S.A.; Ellicott-Brandt, Inc., Baltimore, Maryland; Ellicott Fabricators, Inc., Baltimore, Md.; McConway & Torley Corp., Pittsburgh, Pa.; Timberland-Ellicott, Limited, Woodstock, Ontario, Canada; Dragues Ellicott France, Paris, France; Dragas Ellicott do Brasil Ltda., Rio de Janeiro, Brazil; Ellicott de Mexico, Mexico City, Mexico.

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Hook an OWEN Clamshell Bucket to your crane and you're *sure* of superior performance and longer life. For OWEN Buckets have exclusive super-efficiency and long-lived features you won't find in ordinary clamshells.

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New Equipment . . .

Continued from page 43

tember. Parsons is a division of Koehring Co.

The 1500 mounts on all popular makes of utility tractors—new or used—with only four pins, providing fast, easy attaching and detaching.

New features on the 1500 include: exclusive "dock fenders"—rubber stops mounted on each side of the frame to cushion the pivot assembly; Timken tapered roller bearings on swing post; self-aligning ball bearings at all wear points; telescoping non-

skid stabilizers; adjustable "dig-all" bucket to handle all types of excavating including straight down digging; "Hydaway hydraulics"—cylinders, pistons and hoses on dipper stick are fully enclosed and protected; and automatic wear compensation on swing mechanism eliminating adjustment.

Power Shifted Wheel Tractor-Scrapers

Manufacturer: Caterpillar Tractor Co., Department EE, Peoria, Ill.

Claims: Two 420 maximum horsepower wheel tractor-scrapers, featuring a new torque divider power shift transmission, have been announced by Caterpillar. The new machines are the four wheel 630 Series A and the two wheel 631 Series A.

Both tractors are powered by a completely new design, four-valve-in-head, diesel engine that has a maximum 420-hp rating, and a 335-hp flywheel rating. The 630A has a top speed of 41 mph and the 631A, 31 mph. Other machine features include specially developed 28-ply 29.5 x 35 tires; "live" air actuated cable controls; advanced design steering sys-

tems for both units; and a high degree of service accessibility.

Scrapers are of Lowbowl design and have a struck capacity of 21 cubic yards and a heaped capacity of 28 cubic yards. Refinements to the basic Lowbowl concept permit corner voids to be filled without staying excessively long in the cut.

For extra-large production under special job conditions, a new unit, the 630A-482C tractor-scraper combination, will be available. The new 482 Series C has a 35-yd. heaped capacity and 28-yd. struck. These units are designed specifically for easy loading material and long hauls without adverse grades.

Matched to the torque divider power shift transmission is a new D343 diesel engine specially developed for the new tractor-scrapers.

To "shift," the operator need only move the selector lever to one of three speed range positions. Within each range, the most appropriate of three "drives" is automatically selected to meet changing power requirements. The transmission combines planetary gear groups with a torque converter. The three automatically selected drives are: 1) torque divider drive; 2) direct drive; 3) overdrive.

Torque divider drive is the first selected in each speed range, sending 25% of engine torque through the converter and 75% directly to the power train. As travel speed increases, the unit shifts to direct drive and then to overdrive.

A dash-mounted indicator shows the operator when to shift to the next higher speed range. The automatic shifts again take place in the next higher range. Unique feature of this arrangement is its utilization of high torque multiplication when power needs are greatest, then automatic shifting to the more efficient direct drive and overdrive as conditions permit.

In order to obtain maximum rimpull during loading, the range selector lever can be placed in a special loading range position. This holds the transmission in torque divider drive, and permits matching scraper speed to the pusher throughout loading.

To best meet transmission power requirements, the diesel engine was designed to have two governor balance points. This "flattened-out" the horsepower curve and results in the engine developing a high level of horsepower at the time automatic shifts take place.

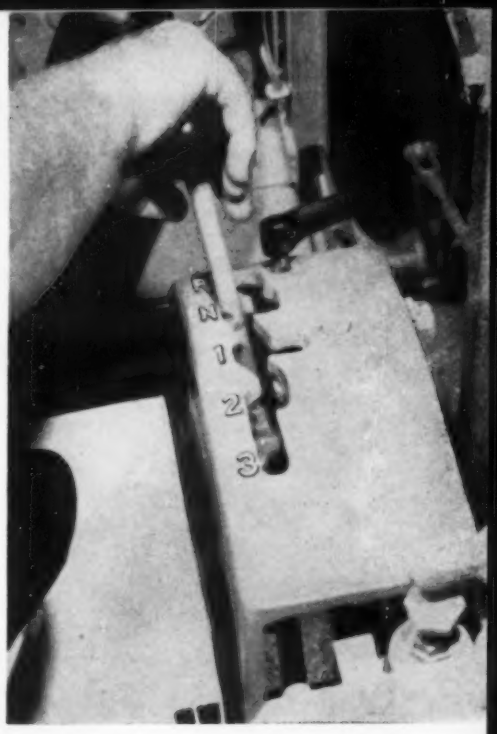
Scrapers are operated by an air actuated, double drum cable control. The unit is driven by a live power shaft directly off the engine, providing full cable control whenever the engine is running.

The 631 tractor-scraper utilizes a full hydraulic, two-cylinder steering system with follow-up linkage that gives the operator realistic "feel" of the machine. Full 90° turns are made without cylinders reversing.

Steering gear of the 630 incorporates a hydraulic steering cylinder mounted in a protected position on the tractor frame and connected directly to the pitman arm. The 630 is easily handled in tight quarters because of a low 13 to 1 steering ratio.

The 631 Series A two-wheel tractor is shown here with a scraper of 21-yd. struck capacity.

Ease of serviceability was one of the prime design criteria for the new machine. Oil pans of both tractors are removable without pulling the engine. All engine accessories can be repaired or replaced with the engine still mounted in the tractor. The 631 tractor dash can be swung-out to give access to the starting engine, air compressor and water pump.



Special Coal Blade

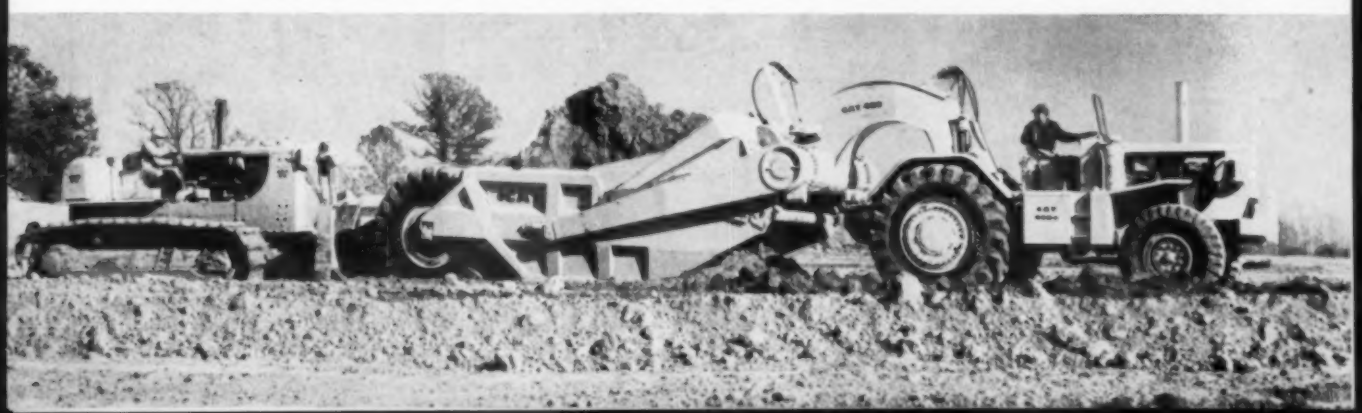
Manufacturer: Rish Equipment Co., Department EE, Bluefield, W. Va.

Claims: The special Rish coal blade, which doubles the capacity of standard dozer moldboards and increases the economical pushing distance of conventional dozers, now is available for use with International TD-25, TD-20 and TD-15 crawlers, it has been announced by International Harvester Company's Construction Equipment Division.

Utility and industrial customers in many parts of the country are using the large-capacity, wing-type blade

Continued on next page.

With a heaped capacity of 35 yards, the Cat 482 Series C scraper is teamed here with the 630 Series A four-wheel tractor.



FOR 50 YEARS...
Finest in the Field!
Rely on the bucket contractors rely on. The Omaha Dragline Bucket gives full load with every cast. Perfect balance makes it easy to spot dump. Alloy steel cutting teeth stay sharp, tough and ready. Strike pay dirt now! Complete information and specifications await your letter.
DRAKE-WILLIAMS MOUNT • OMAHA, NEBR.
OMAHA
DRAGLINE BUCKETS

New Equipment . . .

Continued from page 45

which "live rolls" each load and first was designed for the International TD-24 crawler.

In recent tests, the TD-25 pushed blade loads averaging 20.9 tons at 2.55-mph average speeds.

Over-all length of the TD-25 blade is 15 feet 6 inches. Height is 6 feet and weight is 5,080 pounds. The TD-20 blade, which weighs 2,200 pounds, is 12 feet long and 5 feet high. Weight of the TD-15 blade, which is 12 feet long and 4 feet high, is 1,600 pounds.

All three Rish blades are manufactured from high-carbon steel and can be used with direct-lift hydraulic or rear-mounted cable control units.

Rish Equipment Co. is a distributor of International equipment.

Engine Generators

Manufacturer: Wincharger Corp., Department EE, Sioux City, Iowa.

Claims: A series of compact engine generators has been introduced by Wincharger Corp., a subsidiary of Zenith Radio Corp. Powered by a Wisconsin VH4D air-cooled gasoline engine, the Winco generators are rated at 12,000 watts AC, and are equipped for remote starting. They are capable of producing ample power and energy for a wide variety of standby and portable power needs for industry, institutions, homes, farms and ranches, and for mobile power. The generator is a 115/230 volt 60 cycle unit.

This new Winco series also features Maxi-Watt power and control which gives maximum power for unusually heavy motor loads, and maximum efficiency for normal loads. Tests show that this generator will carry such loads as a 5-hp motor, plus 6,000 watts of simultaneous resistive load.

"He's recovering from an accident . . . a thought struck him."

LITERATURE FOR EARTHMOVERS

Subject: **Compact Tractors**

Content: Utility applications of the new Allis-Chalmers H-3 and HD-3 compact crawler tractors are pictorially described in an 8-page catalog. Also included is information about the engineering, design and construction features along with data on gasoline or diesel power plants, and general specifications. Matched equipment that increases the versatility of the H-3 and HD-3 is also covered. Ask for catalog UT-130.

Where to get: Allis-Chalmers Mfg. Co., Department EE, Milwaukee 1, Wis.

Subject: **Tractor-Scraper**

Content: A 16-page multi-colored bulletin describes the LeTourneau-Westinghouse 20-cu. yd. (heaped)

capacity model C Speedpull. This well-illustrated booklet contains a full and complete description of this six wheel tractor-scraper combination, and points out many features designed for long-haul earthmoving.

Where to get: LeTourneau-Westinghouse Co., Department EE, Peoria, Ill.

Subject: **Magnetic Fan Drive**

Content: An automatic fan drive for heavy-duty International V-8 truck engines is explained in a 4-page catalog. It will be available for heavy-duty International six-cylinder engines in the near future. The new drive is an electro-magnetic clutch located behind the fan. It is activated by a highly sensitive thermostatic control located in the coolant stream. This control is preset to engage and disengage the clutch between desired engine operating temperature limits. Automatic engaging of the clutch when the coolant temperature reaches a maximum desired temperature results in normal fan operation. When the coolant temperature drops to normal, the fan automatically becomes free wheeling. This frees as much as 12% of usable engine horsepower. In addition to fuel savings, automatic fan drive aids in easier engine starting, quicker warm-ups. Ask for form CR-136-K.

Where to get: International Harvester Co., Department EE, 180 N. Michigan Ave., Chicago 1, Ill.

Subject: **Crane Carrier**

Content: A two-color specification sheet and bulletin describes the Schield Bantam heavy duty model 406 crane carrier. Included in the bulletin are complete specifications as well as many features of the carrier. Standard equipment on the model 406 carrier includes a 220-hp gas engine, air brakes on all wheels, and power steering. Ask for bulletin A-303.

Where to get: Schield Bantam Co., Department EE, Waverly, Iowa.

Subject: **V-Belts**

Content: Design features and performance advantages of all Raybestos-Manhattan V-belts are detailed in a new 8-page bulletin. Included are Condor V-belts and patented FHP V-belts, both offering special designs for heavy and light duty, short and long center applications. In addition to ordering information and specifications, the new bulletin includes graphically illustrated sections on the comparative advantages of straight sidewall construction. Ask for bulletin M-201.

Where to get: Manhattan Rubber Div., Raybestos-Manhattan, Inc., Department EE, Passaic, N. J.

Subject: **Rubber-Tired Traxcavator**

Content: Design and engineering details of the 966, largest of Caterpillar's wheel Traxcavator line, are described in a 12-page booklet. Features which contribute to the quick response performance, versatility and operator safety and convenience of the 2¾-yd. bucket capacity machine are covered in detail. Ask for form No. 33915.

Where to get: Advertising Div., Caterpillar Tractor Co., Department EE, Peoria, Ill.

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SUPERcranes are here! Throw away the old yardsticks on crane buying because the 1961 **SUPERcranes** from Bucyrus-Erie will change all that! **SUPERcranes** mean more tonnage-lifting capacity per dollar invested. Tell us how much you want to lift and we'll tell you how much you can save...with a **SUPERcrane!** See your nearest distributor, or write Bucyrus-Erie Company, South Milwaukee, Wisconsin. BUCYRUS ERIE®

1E61

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LARGE SHOVELS, CRANES, DRAGLINES — 3 YDS. & UP

EUCLIDS
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12-yd. Bucyrus-Erie dragline.
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Large stripping shovels.
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HEAVY EXCAVATION EQUIPMENT
DRAGLINES, SHOVELS, CRANES, DRILLS, TRUCKS

9-W B.E. Elec. Drag, 200′, 8 yd. or 160′, 10 yd.
9-W B.E. Diesel Drag, 165′, 12 yd.
7-W B.E. Diesel Drag, 140′, 7 yd.
7400 Marion Diesel Drag, 175′, 13 yd.
7400 Marion Elec. Drag, 175′, 12 yd.
1855 P&H Diesel Drag, 130′, 10 yd.
625 Page Diesel Drag, 160′, 9 yd.
631 Page Elec. Drag, 200′, 8 yd.
621-S Page Diesel Drag, 125′, 7 yd.
200-W B.E. Diesel Drag, 125′, 6 yd.
2400 Lima Elec. Drag, 130′, 6 yd.
2400 Lima Diesel Drag, 130′, 6 yd.
4500 Manitowoc Drag, 120′, 5 yd. & 140′, 4 yd.
120-B B.E. Elec. Drag, 115′, 5 yd.
71-B B.E. Crane with 160′ boom.
3900, 3500 & 3000 Manitowoc Cranes.
111-M Marion Drag, 100′, 4 yd.
1055 P&H Diesel Drag, 80′, 4 yd.
1601 Lima 4 yd. Shovel/Drag.
1201 Lima Drag, 85′, 3 yd.
54-B B.E. Drag, 80′, 2½ yd.
5560 Marion 26 yd. Elec. Shovel.
5323 Marion 18 yd. Elec. Shovel.
190-B B.E. 8 yd. Elec. Shovel.
151-M Marion 7 yd. Elec. Shovel.
1600 P&H 6 yd. Elec. Shovels.
170-B B.E. 6 yd. Elec. Shovel.
4161 Marion 6 yd. Elec. Shovel.
2400 Lima 6 yd. Std. & H.L. Shovels.
120-B B.E. & 4121 Marion 4 yd. Elec. Shovels.
1055 P&H 3 yd. H.L. Shovel.
111-M Marion Std. & H.L. Shovels.
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Euclid Trucks, Rr. & Bottom Dump; Dozers, etc.

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LARGE SHOVELS, CRANES, DRAGLINES — 3 YDS. & UP

Marion 482 #6353
Marion 4161 #8197
Bucyrus-Erie 54-B Diesel #10353?
Bucyrus-Erie 150-B shovel #106870
All equipment subject to prior sale.
Contact:

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7-W electric dragline, serial No. 741, equipped with 180-ft. long boom, 6-cu. yd. bucket, and arranged for power supply of 3-phase, 60-cycle, 2,300 volts. Good working condition. Located in Middle West.

Write
ENGINEER
Box 3756 South Milwaukee, Wis.

Bucyrus-Erie 190-B electric shovel 8-yd. dipper. Bucyrus-Erie 170-B electric shovel with 6½-yd. dipper. Location Eastern United States.

Write
ENGINEER
Box 3758 South Milwaukee, Wis.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

BACKHOE & CRANE

1—Link-Belt model LS-80 crane with 50′ boom, Rudomatic tagline, Buda gas engine, s/n 7074
1—Link-Belt model LS-60, Buda gas engine, s/n 8128.
1—Bucyrus-Erie 10-B crawler-mounted backhoe, s/n 16626; powered by Buda model 326-hp. 6 cylinder gasoline engine, s/n 11579. Backhoe with 14′ boom, 4′6″ stick, 29″ wide bucket at side cutters with 3 teeth mounted on 9′ long x 7′8″ wide crawlers with 14″ pads.

DRAGLINE

1—Bucyrus-Erie 22-B ⅝-yd. heavy-duty dragline and clamshell with 45-ft. boom, Rudomatic tagline, rotating fairleads, long wide Cats (12-ft. 9-in. long, 10-ft. 6-in. wide, 30-in. treads). General Motors diesel power, machine s/n 114843.

MISCELLANEOUS

1—LeRoi 315 air compressor on 4 pneumatic tires, 7 or 8 years old.
1—Ruhr M-1—½-cu. yd. heavy-duty grapple, new, excellent buy.
1—Wayne 36″ rider industrial vacuum pick-up sweeper, demonstrator, 2 years old.
1—CMC Jetcrete with all accessories. Excellent condition, practically new with all extra accessories.
1—Used Kennedy-VanSaun revolving scrubber screen, 48″ dia. x 21′ long, in excellent shape and complete with all new parts including extra scrubber sections and new sizing screens.
2—Caterpillar D13000 power units in good shape with radiator less clutch, s/n 3R8157SP and 3R8098SP.
1—Clark 10,000-lb. fork lift, solid tires.

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SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Koehring model 205 shovel and hoe—½-yd., serial No. 5262C, powered with International gas engine #17366. 1948 model.
Lorain model L-41 hoe with Waukesha gas engine. Serial No. 17832.
Unit model 1020 ¾-cu. yd. shovel, serial No. 51256, powered with Chrysler gas engine.
Insley K12 ½-yd. backhoe, serial #3671, powered with Buda engine.
Model TU-3 Snogo snow plow, serial No. 768, with Climax R-61 engine, serial No. 15825, mounted on FWD truck.
New KT-8 4-6 ton Buffalo-Springfield tandem roller, serial #29765. Powered with Y112 Continental engine with torque converter. Including retractable towing attachment and brakes on wheels.

CLYDE EQUIPMENT CO.
3410 First Ave. South Seattle 4, Wash.

Bucyrus-Erie model 10-B dragline, serial No. 88595 with Buda gasoline engine, 28′ boom. Machine completely rebuilt $5,250
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Bucyrus-Erie model 15-B, serial No. 116611, cambered boom backhoe with Caterpillar D315 diesel engine, extended crawlers with 24″ treads. Hour meter reading 1,850. Delivered new in January 1959. Excellent condition $17,000
Bucyrus-Erie model H-5 Hydrocrane, serial No. 119382, complete with tagline reel, ½-yd. GP clamshell bucket, mounted on ten wheel International truck chassis. Entire unit sold new in 1959. Very low hours. Like new condition throughout $20,000
Bucyrus-Erie model 15-B Transit crane, serial No. 117102. Factory truck carrier with White CC160 gasoline engine, 10.00 x 20 tires. Upper works powered by Caterpillar D315 diesel engine. Cambered boom backhoe and clamshell crane equipment available. Currently being rebuilt in our shop.
Bucyrus-Erie model 22-B, serial No. 116958, with Caterpillar D315 diesel engine, ¾-yd. cambered boom backhoe, 26″ treads with 12′-0-⅜″ crawlers. Currently being rebuilt in our shop.
Bucyrus-Erie model 51-B 2½-yd. shovel, serial No. 62581, with Caterpillar D17000 diesel engine, standard crawlers with 36″ treads. Low hours. Reconditioned and in very good condition throughout.
Lorain Model TL-25 ¾-yd. cambered boom backhoe with 3-71 General Motors diesel engine, extended crawlers, wide treads. Machine delivered new in 1956. Undercarriage rebuilt this year. Good working condition throughout. As inspected.$10,500
Bucyrus-Erie Hydrohoe Attachment for H-3 Hydrocrane, complete with 18″ general purpose dipper, 20″ utility dipper, 12″ narrow dipper and all necessary fittings. Excellent condition $750
Bucyrus-Erie model 15-B shovel front complete with dipper trip, chains and lagging $1,200
Bucyrus-Erie model 22-B shovel front complete with dipper trip, chains and lagging. Good condition $1,500
Lorain ¾-yd. shovel front, Amsco bucket complete with dipper trip. Excellent condition throughout $1,500
Bay City model 45 ¾-yd. shovel front complete with dipper trip. Good condition. $1,500

BINDER MACHINERY CO.
Brighton St., Union, N. J.
MUrdock 8-0060

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

HYDROCRANE HEADQUARTERS
Used H-2 and H-3 Hydrocranes

H-2 Hydrocrane on I.H.C. truck needs some work $1,000

H-2 Hydrocrane on I.H.C. truck, working condition $1,750

H-3 Bucyrus-Erie Hydrocrane, 1952, on Ford F-6 truck including cab, reel, bucket, 2-piece boom. Excellent condition.

H-3 Bucyrus-Erie Hydrocrane, 1953, mounted on 6 x 6 truck chassis, bucket and reel, very good condition.

H-3 Bucyrus-Erie self-powered Hydrocrane, 1955, available with hoe equipment, including 60" and 18" wrist action dippers, mounted on Ford F-7 truck chassis.

H-3 Bucyrus-Erie Hydrocrane, 1950, converted to self-powered machine with new 4-cylinder Continental gas engine, new pumps, cab, 2-piece telescopic boom, mounted on 1953 G.M.C. truck chassis. Special price $6,500

DRAGLINES

38-B Bucyrus-Erie 1½-yd., Cat D13000 diesel engine, long cats, 1953, 50' boom, dragline fairlead, very good condition.

38-B Bucyrus-Erie 1½-yd., Cat D13000 diesel engine, long cats, wide crawlers, 90' boom and jib, fairlead, very good.

22-B Bucyrus-Erie, ¾-yd., G.M.C. 3-71 diesel engine, 12' cats, 26" wide treads, 1948, crawlers rebuilt, good.

22-B Bucyrus-Erie, ¾-yd., Cat D318 diesel engine, long crawlers, 30" treads, 1955, excellent condition.

22-B Bucyrus-Erie, ¾-yd., Buda K-428 gas engine, 12' long cats, 26" treads, 1955, excellent condition.

15-B Bucyrus-Erie, ½-yd., 30' boom, fairlead, Buda gas engine, good condition, complete with bucket.

34 Lima, ¾-yd., Cat D318 diesel engine, 45' boom, fairlead, 30" treads, long crawlers, overhauled, excellent condition.

34 Lima, ¾-yd., Buda gas engine, 45' boom, fairlead, 30" treads, repainted and in good condition.

45 Bay City, ¾-yd., Cat D4600 diesel engine, fairlead, long cats, 26" treads, good sound machine.

SHOVELS

22-B Bucyrus-Erie, ¾-yd., G.M.C. diesel engine, 12' long crawlers, 26" treads, 1948 machine, good condition.

22-B Bucyrus-Erie, ¾-yd., Buda K-428 gas engine, 12' cats, 26" treads, 1955 machine in excellent condition.

15-B Bucyrus-Erie, ½-yd., gas engine, unused shovel attachment with new dipper, good condition.

34 Lima, ¾-yd., Cat D318 diesel engine, 1948, 26" treads, overhauled condition, ¾-yd. dipper.

375 American, ¾-yd., Waukesha gas engine, ¾-yd. shovel dipper, a close out bargain at $2,500.

HOES

38-B Bucyrus-Erie, 1½-yd., Cat D13000 diesel engine, 1953, long cats, 33" treads, 1½-yd. hoe dipper, very good.

22-B Bucyrus-Erie, ¾-yd., Cat D318 diesel engine, cambered boom, 1955, long cats, 30" treads, 29" dipper, excellent.

34 Lima, ¾-yd., Cat D318 diesel engine, 1949, long cats, cambered hoe boom, overhauled condition.

LIFTING CRANES

1500 Manitowoc, 1-yd., Waukesha gas engine, 80' boom, an older machine but in good working condition. Priced to sell.

"L" Quickway 10-ton capacity truck crane, gas power, 80' boom and jib, mounted on available 15-ton truck carrier, very good.

45 Bay City, Cat D4600 diesel engine, 45' boom, good condition, reduced in price to sell.

357 Unit Wagon Crane, 7 ton capacity. Chrysler engine like new, overhauled, folding boom, excellent condition.

RENTAL AND DEMONSTRATION MACHINES FOR SALE

2 used model 30-B Bucyrus-Erie machines equipped with hoe, shovel, dragline or crane attachments, Cat D318 diesel or G.M.C. 4-71 diesel engines, long cats, 36" treads, 1600 hours on meter, discounted for quick sale.

3 used model 11-B TC Transit machines available with hoe, shovel, crane or dragline equipment, mounted on 6 x 6 carriers, low hours and mileage. Call or write for our bargain prices.

J. P. WAITE, INC.

3304 W. Pierce St. **EV 4-1900**

Milwaukee, Wis.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

SHOVELS—CRANES—ATTACHMENTS

Bucyrus-Erie model 30-B heavy duty crane, clamshell, dragline with long and wide undercarriage, 60' boom, pendant suspended. Powered by International UD-525 diesel engine. Out of our rental fleet. $39,500 FOB Elizabethtown, Ky.

Bucyrus-Erie model 38-B, 1½-yd. dragline with long and wide track, 11'6" wide, 7' 5" long, 33" pads, 70' boom, pendant suspension, unit 79 extra counter weights. Powered by IHC model UD-1091 diesel engine. Total weight 109,360#. Replacement cost $60,915. Like new condition, rental service is all this dragline has been used. $45,000 FOB Elizabethtown.

Bucyrus-Erie model 15-B, ½-yd. dragline with 40' boom and powered by IHC UD-9 diesel engine. Undercarriage completely rebuilt. #4042. $7,500 FOB Louisville, Ky. (Price reduced from $9,500)

Bucyrus-Erie model 15-B, ½-yd. backhoe. Powered by International UD-9 diesel engine. #9021. $5,500 FOB Louisville.

Bucyrus-Erie model 22-B heavy-duty dragline, clamshell, 60' boom pendant suspension, lifting crane. Long and wide tracks, extra counter weights, 30" treads. Powered by IHC UD-525 diesel engine. Replacement cost $34,499.60. #3280. $22,000 FOB Louisville.

Bucyrus-Erie model 22-B, ¾-yd. capacity basic machine. Powered by IHC model UD-525 diesel engine. Less than 3 years old. Excellent condition. From our rental fleet. $19,750 FOB Evansville, Ind.

Lorain model 40, ¾-yd. shovel. Powered by gasoline engine. #7912. $2,500 FOB Elizabethtown. (Price reduced from $3,500)

Unit model 514, ½-yd. shovel with Chrysler gasoline engine. #10920. $2,500 FOB Paducah, Ky.

P&H model 255-A, ¾-yd. shovel, crawler mounted. Powered by Caterpillar model 315 diesel engine. #5918. Excellent condition. $8,500 FOB Elizabethtown.

Lorain model L-820, 1¾-yd. shovel, crawler mounted. Powered by Caterpillar model D13000 diesel engine. Shovel in operating condition. #4037. $7,500 FOB Elizabethtown (Price reduced from $9,500)

Insley model K-12 excavator with 30' boom, ½-yd. dragline bucket and complete shovel front with dipper. #7060. $5,000 FOB Paducah. (Price reduced from $6,000)

Unit model 1020, ¾-yd. shovel, powered by GMC 3-71 diesel engine. #1207. $3,500 FOB Middlesboro, Ky.

General model 307, ¾-yd. dragline with 40' boom. Powered by GMC 3-71 diesel engine. #4040. $6,700 FOB Evansville.

Lorain model 820 shovel front attachment. #905. $1,200 FOB Elizabethtown.

Quick-Way model E, ⅜-yd. shovel front. #501. $150 FOB Elizabethtown.

Write—Wire or Phone Jim Waddell
BRANDEIS MACHINERY & SUPPLY CORP.
Louisville 1, Ky.

P. O. Box 1705 **MElrose 7-4741**

EXCAVATORS

2—Bucyrus-Erie 30-B shovels, GMC 4057 engines, repaired, cleaned and painted, excellent condition, ready for a production job.

1—Bucyrus-Erie 38-B dragline, GMC 6057C engine, Torcon converter, 45' standard boom, fairlead. A late model, clean and ready to go.

1—Bucyrus-Erie 22-B dragline, IHC UD-14A engine, 50' boom, fairlead. Serviced, repaired, cleaned and painted.

1—Lorain TL-25 dragline, Cat 315 engine, 35' boom, fairlead, wide tread, 22" track pads, rebuilt, excellent condition. See it before you buy.

1—Link Belt LS-71 dragline, IHC UD-14A engine, 45' boom, fairlead. Repaired, cleaned and painted, priced to sell.

1—Lima 604 dragline, Cummins HIS engine, 50' boom, fairlead. A serviceable machine, checked, cleaned and painted.

1—Lima 34 dragline, Cat 318 engine, 35' boom, fairlead, workwise and serviceable. A bargain. Can you use it?

1—Northwest 25 dragline, Cat 4600 engine, 35' boom, fairlead. Workwise and serviceable as is.

1—Quickway model "L" trench hoe, IHC U-9 engine, mounted on FWD commercial chassis, single rear axle. A clean machine and carrier. Need a good dependable rig? Look it over, try it, buy it.

1—Northwest 104 dragline Cat engine, 35' boom, fairlead. An old machine, workwise and serviceable as is. Make an offer.

1—P&H 600 shovel. A good old rig for a standby.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

EXCAVATOR ATTACHMENTS

1—Schield Bantam model M-49 shovel attachment—good condition. Bargain.

1—Quickway model "L" dragline, crane attachment, complete, fairlead, 30' boom, pin connected, pendant suspension, ½-yd. Quickway drag bucket.

1—Osgood 200 hoe attachment, boom, gantry, arm with 36" plate dipper. Serviceable as is.

1—Wellman, 1-yd. drag bucket, size 201, model DXL, repaired, ready to go to work.

1—Lima 604 shovel attachment complete, good condition, serviceable as is.

1—Kiesler 2½-yd. clamshell bucket type "H", good condition.

1—Lima 34T hoe attachment, 30" dipper. Excellent condition.

1—Bucyrus-Erie model 22-B shovel attachment complete, good condition—a bargain.

1—Quickway model "L" shovel attachment complete, good condition.

1—Bucyrus-Erie model 120-B dragline attachment complete, fairlead and deck equipment. Good condition.

CRUSHING & ASPHALT EQUIPMENT

1—Universal 20 x 36 roller bearing jaw crusher, cast base, one flywheel grooved, mounted on steel wheel chassis with 24" x 25' conveyor.

1—Barber Greene 848 asphalt plant with 813 feeder, 881 cold elevator, 837 dryer, 880-6-1 and 880-3-1 hot elevators. Clarage type 1E dual exhaust fan powered by UD9 engine, Twin Cone dust collector, 866 gradation unit, 348 screen, 848 mixing unit, powered by GMC 4-71 engine, gradation unit and some elevators with electric drives, switch panel and controls for motors. Caterpillar D13000 diesel electric set trailer mounted. Cleaver Brooks 125-hp portable steam generator, trailer mounted, auxiliary asphalt pump with gasoline power. Plant is available in good mechanical and operating condition. Has produced 15,000 tons material, since thoroughly overhauled, cleaned and painted.

1—Standard maintenance type asphalt distributor, trailer mounted, dual tires, Wisconsin engine on pump, serviced, cleaned and painted, ready to go to work.

1—Woods model 54 tractor drawn roadmixer, PTO for 2U Series D-8, Chrysler engine on accessories. A clean machine ready to go to work.

SCRAPERS & TRUCKS

2—Koehring WD-60 Dumptors, GM-4057 engines, good or new recap rubber, repaired, serviced, cleaned and painted.

2—Euclid SS-24's, 33LDT Tractors with 32SH scrapers, turbo charged, Cummins engines, 27 x 33 30-ply rubber. Late models, serviced and ready to go.

3—Euclid 7-TDT tractors with 14SH scrapers, Cummins engines, good rubber, machines serviced, checked, repaired as required. Cleaned and painted, ready to go.

2—Euclid 14TDT tractors with 21SH scrapers Cummins engines, rubber fair to good. Serviceable, workwise, as is.

2—Caterpillar DW10's IV Series with #15, 4W Series scrapers, serviceable units. Checked, repaired, cleaned and painted.

2—Euclid 91FD trucks, GM-671 engines, quarry bodies, good rubber, clean, ready to go to work. Sale or rent.

2—Caterpillar DW20's, turbo-charged engines. Repaired, serviced, cleaned and painted. Rubber good, serviceable.

2—Euclid 23-TDT tractors with 122-W bottom dump Wagons, GM 6-110 engines, good condition. Located at Los Angeles.

THE COLORADO BUILDERS' SUPPLY CO.

1534 Blake Street **Denver 2, Colo.**

Bucyrus-Erie 54-B shovel #100761, GMC diesel model 6-110, Torcon converter, 36" pads. Rebuilt.

Bucyrus-Erie 54-B shovel #107758, Buda 6DC-1879 engine. Rebuilt.

Bucyrus-Erie 54-B shovel #51079, Buda engine model 6DC1879.

Bucyrus-Erie complete 54-B shovel attachment.

Four Caterpillar DW20 scrapers #11C880, 891, 892, 901, excellent condition.

W. I. CLARK CO.

P. O. Box 301 **New Haven, Conn.**

Tel. CH 8-2131

MISCELLANEOUS EQUIPMENT

Tractor Mounted Rock Drills

2—Used TWM-3 Joy Challenger drills mounted on D8 caterpillar tractor—TM-500 drill—22′ feed, 20′ steel change, AW80 winch.
PRICE: $12,000 ea.
PRICE without tractor: $ 9,500 ea.

1—Used TWM-2 Joy drill mounted on three wheel rubber tired Ford tractor—TM-500 drill—MW-22A Feed, AW80 hoist.
PRICE: $7,500
Above located at our warehouse.

CLYDE EQUIPMENT CO.
Portland, Ore.
Phone: CApital 7-5561

3—Allis-Chalmers TS-360 motor scrapers. New 1957, worked between 2,000 and 3,000 hours. Heaped capacity 20 cu. yds. Price: $15,000 each.

WALKER & PARTNERS LTD.
23 Claremont Crescent
Sheffield 10, England

Warner & Swasey Gradall, Minneapolis-Moline gasoline engine on upperstructure, Duplex 4 x 6 Carrier. Good condition. Price: F.O.B. Lansing, Mich. $6,750

Warner & Swasey 36″ push type rehandling bucket. Price: F.O.B. Detroit Mich. .$400

MOTOR GRADERS

Adams model 512 motor grader with 13.00 x 24 tires front and rear, cab, scarifier, lights, heater, defroster, windshield wipers, power steering, snow plow and wing. Engine overhauled recently. Price: F.O.B. Lansing $6,250

Adams model 550 motor grader, power steering, UD-16 engine. Price. F.O.B. Detroit. $8,500

Austin-Western Master 99 motor grader, cab, windshield wipers, scarifier, lights. Price: F.O.B. Detroit $8,650

Adams model 610 grader, 14.00 x 24 tires front and rear, cab, scarifier, power steering. Price: F.O.B. Lansing $7,900

SCRAPERS-ROOTERS

LeTourneau-Westinghouse model "C" Tournapull with cab and 24″ tires front and rear. #GT 4434. Price: F.O.B. Detroit. $12,000

LeTourneau-Westinghouse model "D" Tournapull, 18.00 x 25 tires front and rear. Price: F.O.B. Detroit $7,500

LeTourneau-Westinghouse model "D" Tournapull, 18.00 x 25 tires front and rear. Price: F.O.B. Detroit $8,500

LeTourneau-Westinghouse model FP tractor drawn scraper, 14-yd. struck capacity. Price: F.O.B. Detroit $5,000

LeTourneau-Westinghouse model S3 rooter. Like new condition. For use with tractor of 50 hp or more. Price: F.O.B. Detroit. $1,000

MISCELLANEOUS

Littleford model 115 Tankar Heater. Price: F.O.B. Lansing $950

Galion model "P" 3-5 ton portable patch roller. Price: F.O.B. Lansing $995

Layne-Northern pump, capacity 1,200 gpm @250 feet, 100-hp electric motor, 200′ casing, 21 pieces tubing and 21 pieces drive rod. Price: F.O.B. Detroit $2,000

10-ton stiff leg derrick, requires 50-75-hp electric motor. Price: F.O.B. Lansing $2,000

Wisconsin model TF, 3¼″ x 3¼″ two-cylinder power unit, with gear reducer, 1⅝″ shaft, specifications #63367. Like brand new. Price: F.O.B. Lansing $199

LeTourneau-Westinghouse model "C" Tournapull w/P19 scraper. Price: F.O.B. Lansing $13,500

TRACTORS

TD9 International crawler tractor with Bucyrus straight bulldozer blade. Good tracks, cleaned and painted. Price: F.O.B. Detroit $5,000

IHC TD18 crawler tractor with Bucyrus angle dozer. Price: F.O.B. Lansing.$5,500

Caterpillar DW10 rubber tired tractor. Price: F.O.B. Lansing $3,500

Oliver OC3 crawler tractor. Price: F.O.B. Detroit $2,000

TELFORD EQUIPMENT CO.

Detroit, Mich. **Ph. WEbster 3-7330**
Lansing, Mich. **Ph. IVanhoe 4-1468**

MISCELLANEOUS EQUIPMENT

FOR PARTS SALVAGE

51-B shovel #117762, new in 1957. Machine wrecked as result of accident. Suitable for parts, but not worth rebuilding. Tracks good. As is, where is. Price $12,500.

EUCLID-TENNESSEE, INC.
720 Murfreesboro Road **Nashville, Tenn.**
Phone ALpine 6-1648

Bucyrus-Erie 38-B shovel 1½-yd. serial No. 101377 with Cat D13000. Very good condition. $31,000

Lorain 41 shovel ¾-yd. Cat D4600 engine, S/N 14597. $5,000.

Vibro-Plus CH-30 compactor. 3.5 tons, dynamic impact 7 tons. Waukesha diesel. Demonstrator, like new. $5,750.

Kiesler 1½-yd. rehandling clam with counterweight type H. Like new. $1,600.

Esco ¾-yd. orange peel model 379. Excellent. $2,125.

American double-drum sheepsfoot roller, model AD96 with wedge type feet, 48″ width drums, diameter 60″ good condition. $2,000.

Model 25 Northwest backhoe, ¾-yd. Caterpillar D4600 engine, very good condition. $10,750.

Model 300 International tractor with Wain-Roy backhoe, model H-700, 12″ bucket, both 1956 models in excellent condition. $3,750.

Wooldridge model BB120, 14 to 18-yd. scraper, tires 18:00 x 24 65% of new. Scraper in good condition. $2,500.

Model C Scoopmobile with 22′ tower and pallet forks, with ¾ yard bucket excellent condition, Chrysler gasoline engine. Capacity 4,000 pounds. $3,900.

Model 25 Bay City shovel, dragline, backhoe, combination, serial No. 6465, 1952 model, Caterpillar 315 engine, very good condition, $10,800 with any one front. Add $1,250 for each additional front.

Bucyrus-Erie 15-B—½-yd. dragline, standard tracks 16″ treads, 35′ boom, very good condition throughout, 1959 model with less than 2000 hours. $15,925.

K-12 Insley dragline with 45′ boom, fairleads. Serial No. 11289, 1955 model, Buda 326 gasoline engine. Machine in good condition throughout. $8,500.

CONTRACTORS SUPPLY
620 E. 18th St., Kansas City, Mo.
Phone: BA 1-7788

Barber-Greene pugmill, model 848. Heavy-duty mixer with 8-ft. steam jacketed twin shaft pugmill, aggregate hopper, apron feeder, pneumatic tires, air brakes, 700-gallon insulated Bituman tank, distillate burner, 3-in. Kinney metering pump, necessary hood connections for loader, discharge chute, 3-in. Viking transfer pump, 145 hp UD18A International diesel engine. Price on application.

American single-drum truck-mounted skidding jammer. Complete with cable blocks and booms on single axle GMC 450 truck. Runs good $1,500

Bucyrus-Erie 38-B shovel, powered with a Caterpillar D13000 diesel engine. Price on application.

Gardner-Denver 125-cfm air compressor, trailer-mounted. Guaranteed for 90 days. $2,750

Bucyrus-Erie 51-B shovel, equipped with a Buda 6DC 1742 motor. Price on application.

Ingersoll-Rand 315-cfm Gyro-Flo rotary air compressor. Powered with a GMC 371 diesel engine. Has the appearance and condition of a new machine. Excellent operating condition. Half the price of a new machine. Guaranteed 30 days $6,750

We also have a large quantity of jackhammers and mining equipment.

WESTMONT TRACTOR CO.
150 E. Spruce **Missoula, Mont.**
P. O. Box 1445

MISCELLANEOUS EQUIPMENT

AC HD-11 dozer, 1957, 2,600 hours $11,000.

IHC TD-18 dozer, 1958, 1,100 hours, $9,875.

Oliver OC-126 loader, 1957, 1,200 hours, $6,500.

Schield Bantams, Michigan truck cranes, $3,000 up.

GENERAL EQUIPMENT & MACHINE CO.
511 E. Colfax
South Bend, Ind.

CRAWLER TRACTORS

Allis-Chalmers HD21A with rear double drum power control unit and cable dozer. Completely rebuilt and guaranteed.

Allis-Chalmers HD21A with rear double drum power control unit and push plate. Ready to go.

Allis-Chalmers HD16 with rear power control unit and cable dozer. Thoroughly reconditioned guaranteed.

Caterpillar D8 with rear power control unit. Fair condition.

International TD14 with hydraulic dozer. Fair condition.

Allis-Chalmers HD11B with hydraulic dozer. Completely rebuilt and guaranteed.

Allis-Chalmers HD6G with 1½-yd. hydraulic loader. Price reduced after rental.

Caterpillar D4 with 1-yd. hydraulic loader. All necessary repairs made.

Two Allis-Chalmers HD5G Tractors with 1-yd. hydraulic loaders. Excellent condition.

CRANES

Bucyrus-Erie 38-B combination crane, clamshell and dragline. Has GMC 6-71 diesel engine, long-wide tracks, independent propel, extra counterweight. This unit has been completely rebuilt and is in A-1 condition.

Bucyrus-Erie 22-B hoe. Standard crawlers, Caterpillar diesel engine. Fair condition.

Lorain ¾-yd. dragline. Has new GMC 3-71 diesel engine. Excellent condition.

Marion 93-M 2½-yd. shovel. This is a 1952 machine, rebuilt 15 months ago. Cummins diesel engine. Excellent condition.

Insley ½-yd. hoe. Very good condition. Price reduced after rental.

Quick-way ¾-yd. truck mounted hoe. Fair condition.

MISCELLANEOUS

Allis-Chalmers TL12 rubber tired loader with 1-yd. bucket, Diesel engine. Rebuilt.

Two Allis-Chalmers TS260 motor scrapers. These units are being reconditioned in our shop now and will be in excellent condition when repairs are completed.

Galion 8-10 ton tandem roller. All necessary repairs have been made.

Blaw-Knox 34E dual drum paver with boom and bucket. Good condition.

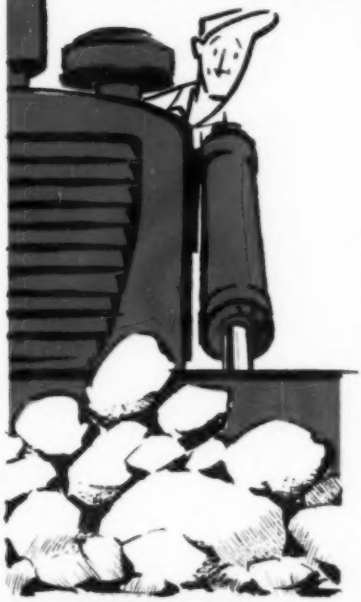
D. D. KENNEDY, INC.

P. O. Box 177 **Bellwood, Ill.**
AUstin 7-4300 **LInden 4-5600**

B-531

WHY TAKE A BACK SEAT . . .

WHEN EIMCO TRACTORS LET YOU MOVE OUT FRONT WHERE YOU BELONG ?

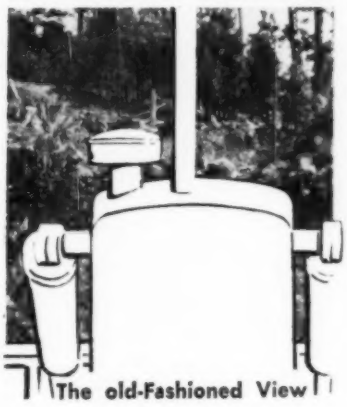


You're out front in more ways than one with the modern Eimco crawler-tractor line!

You operate from a front seat . . . placed where it belongs for real visibility and control, with the heat and noise of the engine behind you. No need to stretch, squirm and squint over and around a yards-long expanse of hood, attachments and overhang to see where you're going. You're right on top of your work with Eimco's common sense up-front operator position, for greater production and work-output, with far less operator fatigue and strain.

We don't know why everybody doesn't build tractors this modern, sensible way. But we know that here at Eimco, we had no need to consider old patterns, dies and production machinery when the Eimco crawler-tractor was designed. With seventy-five years experience in designing and building quality equipment, Eimco had the know-how and facilities to build the best and the first really modern line of tractors. Out of this developed a logical series of unique engineering developments and firsts. One of these was Eimco's exclusive up-front operator position.

There are many others, plus a quality of engineering and craftsmanship that has established a record of nearly seventy per cent savings in maintenance costs against any other leading make of crawler-tractor equipment you can buy today!



The old-Fashioned View

The EIMCO View

MOVE UP FRONT . . . WITH AN EIMCO!

Get all the facts and step up your profit and work output with the Eimco line of modern tractors:

Eimco 103 100 HP Diesel **Eimco 105** 143 HP Diesel **Eimco 106** 205 HP Diesel

TRACTORS • DOZERS • EXCAVATORS • FRONT END LOADERS • LOG LOADERS • SPECIAL STEEL MILL EXCAVATORS AND FRONT END LOADERS

Contact the Eimco dealer or branch nearest you, or write
The Eimco Corporation, P.O. Box 300, Salt Lake City 10, Utah, U.S.A.

"ADVANCED ENGINEERING AND QUALITY CRAFTSMANSHIP SINCE 1884"

THE EIMCO CORPORATION

EIMCO

TRACTOR LOADER DIVISION

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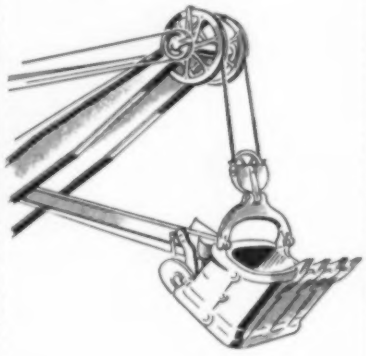
EXPORT OFFICE: 51 - 52 SOUTH STREET, NEW YORK, N. Y.
BRANCHES AND DEALERS IN PRINCIPAL CITIES THROUGHOUT THE WORLD

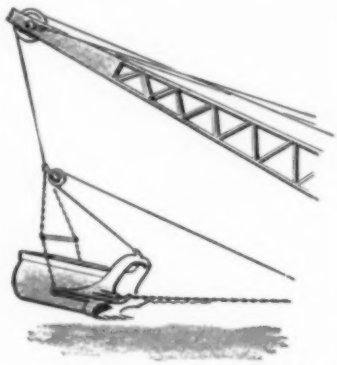
Is "any old" wire rope out of "any old" stock good enough?

Not when you can get what you need from the best combination of wearing qualities in the right Macwhyte!

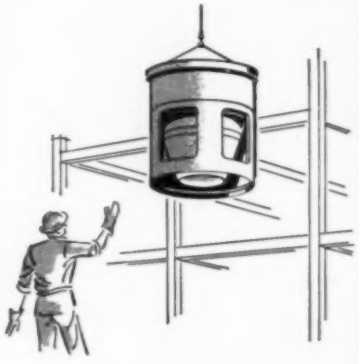
NEED EXTRA STRENGTH?



NEED RESISTANCE TO ABRASION?



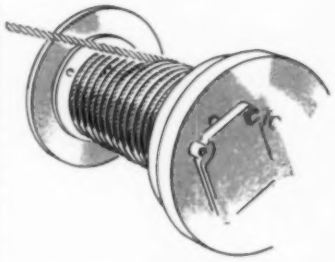
NEED A NON-ROTATING ROPE?



WHICH COMBINATION OF THESE WEARING QUALITIES DO YOU NEED?

NEED RESISTANCE TO CORROSION?

NEED RESISTANCE TO BENDING FATIGUE?



NEED RESISTANCE TO CRUSHING?

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